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Manihot Dichotoma.

Owing to the interest now beginning to be taken in the new species of rubber, it seems desirable to add a few remarks to those made at the Meeting of the Board of Agriculture on April 7th of the present year.

Three acres of the abovenamed species have now been planted out at the Peradeniya Experiment Station. On October 8th the first of these acre plots was exactly two years old from the date of planting. The plot contains 98 trees planted 20′×20′ feet apart, and the average circumference at three feet from the ground is just nine inches at the time of writing. This average girth includes that of every tree. Those in the outer rows have made very poor growth, probably owing to the proximity of neighbouring dadaps and other trees; a few supplies are included; and several stumps broken off by wind at some distance above the ground, but now beginning to sprout again, were also measured. As a precaution against further damage by wind the majority of the larger trees were pruned three months ago, a good many branches being removed in the process, and it may be supposed that this process has retarded growth to some slight extent. Nevertheless the fourteen largest trees show an average circumference of 14 inches, and have more than doubled in girth during the past year.

The second plot at Peradeniya consists of trees planted 12′×12′ in November, 1908; so that these plants are now just a year old. The land upon which these trees are growing was ploughed before planting and has been kept cultivated by means of a disc harrow ever since. The result of this treatment seems to be obvious in the growth of the plants, which average quite 6 inches in girth over the whole area and are already producing seed in considerable quantity.

The third acre has been planted up during the current year. On half the plot the plants stand 8′×8′ (planted from cuttings) and on the other half 6′×6′ (seedlings) in order to test the effect of close planting.

A marked characteristic of *Manihot dichotoma*, which is particularly well seen in the acre of year-old trees, is the extraordinary variability of the species in vegetative characters. This is specially noticeable in the shape of the leaves and fruit capsules. In some cases the leaves might almost be mistaken for those of the ordinary Ceara rubber (*Manihot Glaziovii*), whilst on other trees the leaf lobes are much longer and narrower and deeply wavy in outline. On some trees, again, the seed capsules are nearly smooth (like those of *M. Glaziovii*, though larger), whilst on

others the capsules bear high crinkled ridges or wings. Curiously enough, those trees which resemble the Ceara rubber in the shape of the leaves usually differ widely in the capsules and *vice versa*, and when the whole aspect of the tree is taken into consideration, there is never any possibility of confusing one with the other.

The extraordinary variability in vegetative characters is of special interest as indicating the likelihood of a similar diversity between the yields of latex produced by different trees. Of such a variability, which is known to occur in almost all rubber-yielding plants, we have already some indications.

In the case of a plant which is reputed to afford a very appreciable yield of rubber within three or four years of planting, there can be no doubt of the advisability of selecting the best yielding trees for future propagation whether from seed or by cuttings. Definite experiments in this direction are in contemplation at Peradeniya, but the experiment is one which every planter can and should carry out for himself.

If propagation is by cuttings the production from parents giving a good yield of latex of offspring similarly characterised is practically assured. We have therefore every reason for satisfaction in the result of experiments already carried out by this method, for we have found that cuttings up to two inches in diameter will readily take root and grow into healthy plants. A single well-grown two-year-old tree will furnish upwards of 200 cuttings.

The chief defect which we have so far noticed in this plant is its brittleness, the tops being very liable to damage by wind. In this way large branches may be torn off, or the whole tree broken down or uprooted. Sometimes it seems as if the mere weight of the crown were too much for the strength of the supporting structures, the point of weakness being the place where the first whorl of branches joins the upright trunk.

The twelve largest two-year-old trees were tapped on alternate days from October 7th until the end of the month. Six of the trees were tapped to the wood with the knife only, the remaining six were tapped with the Northway knife and pricker. The following amounts of rubber (in grammes) were obtained in ten days' tapping :—

5·48; 1·91; 3·46; 8·05; 1·78; 8·41;
·77; 5·63; 3·19; 4·00; 3·00; 4·06;

or 47·34 grammes of dry rubber from twelve trees in ten days, in addition to 25·35 grammes of scrap, or 72·69 grammes of dry rubber altogether, which is equivalent to 2·6 ounces.

Supposing that one cooly at 35 cents can tap 120 trees in a day, the cost of tapping works out at Rs. 2-20 per lb.

As was only to be expected, the yield of rubber actually obtained is very small. There is no reason, however, for supposing that any other variety of rubber would have given a larger yield at two years old.

In spite of the small number of trees examined, the variations in yield are well marked, more than ten times as much rubber being yielded by the best as by the poorest yielder.

The only conclusion which can be drawn from the above results is that a commercial yield of rubber cannot be expected in two years from planting, and it is quite impossible to say what the result after three, four or five years may be. It seems probable, however, that it will be possible to distinguish good and bad yielding trees by experiment within three years from planting. Those who intend to give this species a trial would therefore do well to plant up a small area of 1 to 5 acres at once with a view to further planting in two or three years time. Then, if experiments carried out on the trees at Peradeniya indicate that *Manihot dichotoma* is likely to turn out a commercial success in Ceylon, the intending planter will be in a position to cover a further area with the offspring of plants selected for their good bearing quality, using seed or cuttings according to the result of our further investigations. It should be understood that this advice is given without any promise that *Manihot dichotoma* will prove a success in Ceylon as a source of rubber; but, if the species does prove profitable, careful attention to the selection of seed parents will undoubtedly enhance the ultimate profits very materially.

The following list of recent references to *Manihot dichotoma* in the *Tropical Agriculturist* may be of use to readers :—

March 1908 ... New species of Manihot and their Importance, p. 198.
April ,, ... Jequie Manicobar Rubber, p. 298.
May ,, ... Jequie Manicobar and its allies, p. 412.
June ,, ... Ceara or Manicobar rubber, p. 519.
October ,, ... Remarks on the cultivation, preparation and yield of Manicobar, p. 317.
April 1909 ... The New Manihots, p. 319.
May ,, ... The New Rubbers. p. 411.

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GUMS, RESINS, SAPS AND EXUDATIONS.

Extracts from the Report of the Director of Agriculture for the Federated Malay States.

(From the *Agricultural Bulletin of the Straits and F. M. S.*, Vol. VIII., No. 9, September, 1909.)

RUBBER TAPPING.

The Rubber Curing House was completed during the year, and machinery for curing rubber, consisting of an oil engine, a roller and a hydraulic press have been obtained.

There are 900 trees of over nine years old, on which a series of experiments will be made and all data recorded. Many problems of great economic importance await solution. The climate of Malaya differs so greatly from that of Ceylon and other rubber-growing countries, that the results of experiments carried on there cannot with safety be used as giving reliable information for treatment of trees in this country.

The whole question of tapping requires careful investigation. The results given by thin paring of cuts at an angle to the axis of the tree are so good that planters are apt to consider the matter solved, but it is not improbale that punctures instead of cuts may yet be found to give as good or better yields and involve less skilled labour. All the "prickers" which have up to the present been exploited are instruments not for making a puncture but a short deep cut, and consequently damaging relatively more cells of the tree than a cylindrical or sharply conical pricker. There is a large field for ingenuity and careful experiment; and the next few years should produce an instrument which will be a marked improvement on the present weapons.

Excellent work with regular shavings, as thin even as 20-25 to the inch, have been done with the gouge, the Farrier's knife, and with more modern specially adapted tapping knives.

It is important to make certain of the periods which should be allowed to elapse between tappings in order to get maximum yields. After having collected figures of yields on a large number of estates, it is difficult to lay down an absolute rule as to the procedure which experience shows to be the best.

Carefully kept data on some estates show that after a period of some three months alternate days' tapping the amount of latex per tree decreases to an amount which is of less value than the cost of tapping, but after a rest of two months the tree again on the fourth or fifth tapping yields the maximum, which after some forty tappings begins to rapidly decrease.

The reverse of these observations is to be found on other estates where accurate figures of yields show that after continuous tapping for some two or three years, the amount obtained varies only slightly, never steadily decreasing. The variation is caused by climatic conditions, short periods of little or no rainfall reducing the yield, and periods of excessive rainfall producing somewhat the same result. This is due to the relatively less active functioning of the roots owing to drought or excess of water.

Many planters believe in stopping when the trees are leafless, a period of some three weeks each year. The experiments which have been continuously carried on for some eighteen months by this department on 17-year old trees at Krian show a slight decrease of yield during the leafless period.

The notion is also prevalent that tapping should be discontinued during the fruit-bearing period. The figures obtained at Krian show a decrease during the time the trees were in fruit, but no sufficient decrease to seriously increase the cost of tapping. The figures relating to these tapping experiments will be published in the "Agricultural Bulletin."

Careful records have been kept of the weight and bulk of latex each day from each tree, and the ensuing weight of dry rubber.

The question of how far it is advisable to refrain from tapping rubber trees after a period of tapping is one upon which planting opinion differs very greatly. On some estates, after a period of some weeks or months of tapping, a period of about equal length is allowed to elapse without tapping. On others and the majority of places tapping is continued without cessation, in some cases trees having without any reduction of yield been tapped for 3½ to 4 years every other day without cessation. On the question of daily or alternate days' tapping planters are also divided, and experience of yields points somewhat to the advantage of the latter practice.

There is no physiological reason why the tapping should cease during the leafless or fruit-bearing period; the cutting

of the small portions of the bark which tapping implies being in the case of a tree of 20" or more in girth so slight an injury as to be negligible.

The best and simplest criterion for deciding how long to continue tapping is found in keeping a record of the amount of latex from each tree from 1,000 trees or from a field. If these figures show no serious and continuous decline there is no reason to stop tapping. On the other hand when, after a series of tappings, say 40 or 50, the amount of latex obtained decreases in a marked manner, and this decrease is constant, the yields being less and less, then it is advisable to stop for a period of a month at least, and not to begin again until by an experimental tapping it is found that the flow is again large.

On one estate the tapping for a number of cuts was habitually stopped when the yield had attained the maximum, and after some weeks' tapping again produced less yield which increased till the arbitrary time of ceasing. The method, which is adopted to a great extent from fear of using too much bark, is most unprofitable as it leads to stopping before the best yields have been obtained.

It is naturally wise to so arrange tapping operations that it will not be necessary to retap renewed bark for some considerable period, but we do not yet know by experiment in the Malaya States, what length of time is necessary for a healthy tree, carefully tapped, to produce new bark containing a large number of well-filled latex vessels. The time of four years has been arbitrarily fixed by some planters, and their tapping schemes are arranged in relation to that period. That four years, three years, or two years are necessary for the formation of bark suitable for tapping cannot yet be definitely stated, but it is highly probable from isolated cases where such experiments have been made that four years is unnecessarily long.

Experimental work and observations on tapping and yield of rubber made in Ceylon are unfortunately of little value for Malaya. The climate of Ceylon rubber districts, with its periods of dry weather, is not comparable with the conditions in Malaya, where rubber trees are in active growth of root, leaf and other tissues practically every day of the year, and where, even when they are leafless, the growth of trees is not entirely stopped.

On one estate in Perak the yield of dry rubber per acre was 800 lbs., a little less than 4 lbs, per tree, even though the trees were crowded together 220 to the acre; this rubber was sold at an average price of some 4s. per lb., thus realising about £160 gross profit per acre, of which more than 50 per cent. must have been net profit.

PREPARATION OF RUBBER FOR THE MARKET.

There is still no agreement as to the best form in which to prepare rubber for the home market; block, crèpe, sheet and biscuit are made by different planters for different reasons.

One reason which makes it difficult for the producer to make up his mind as to the best form in which to make his rubber is that it is not easy to find what the broker and the manufacturer like best. A big price for a break of crepe gives the impression that this form is desired, and will fetch a better price than block or sheet. Shortly after a purchase of block rubber at a price higher than the rest on the market seems to imply that this kind of rubber is wished for.

The leading brokers, buyers, and manufacturers themselves when asked as to their opinions are found to differ, and so for the present it must remain an open question whether block, crepe, or sheet will get the best reception of the European market.

Light colour and uniformity all through the sample are beginning to be considered as qualities to be aimed at, though the former character is probably only desired by the manufacturer for a class of goods which can never consume a very large quantity of raw rubber, and, therefore, if all prepare to this standard too much may be supplied.

All who have studied the matter, or who have technical knowledge and experience, are agreed that the most important quality to be arrived at in plantation rubber is "nerve," "fibre," "pull," "strength," or whatever other terms may be used for the possessions of elasticity and resilience to a high degree. If this character of Malayan plantation rubber is continued and improved, there is no reason to doubt that the manufacturer will in a short time begin to set a value on it equal to, and perhaps better than, that given to the Para of Brazil.

The exclusion of all latex which may contain too much viscine, resin, etc., since it is obtained from young trees, "bulking" latex is strongly to be recommended; there is always a market for poorer values of rubber by themselves, and the inclusion of a small quantity of inferior latex may considerably

reduce the value of the whole break, and at the same time do harm to the good name of the estate for sound rubber.

Block rubber has great advantages over the other forms, in that it is less bulky and costly for storage and transport, less liable to any damage by damp or heat in transit. Many leading manufacturers and technical experts in Europe consider that the block rubber possesses more of the desirable qualities of the Brazilian Para than crepe or sheet; and the only objection which any of them make to block is the fact that it cannot always be examined for internal impurities without cutting each block. This drawback is obviated if the blocks are made only 1 to 1½ inches thick when they are transparent, and any opaque object included in them can be detected by holding them up to the light.

DISTANCES BETWEEN TREES.

The average number of trees per acre on rubber estates in Malaya in 1908 was 168, or 16 feet by 16 feet apart; the statistics for 1907 showed that on the 31st of that year the average was 153, or 17 feet by 17 feet apart.

This, for many reasons, is an improvement. It is to be regretted that the cultivation of rubber is too young an industry to have sufficient experience of old trees planted at different distances apart to judge of this important question.

The reasons against close planting in rubber—*i.e.*, 12 feet by 12 feet, or 302 per acre, or closer—are:—

That it prevents the tree from growing with full vigour and to the greatest possible size, forcing it to run up to the light and giving it no room for lateral branches.

That it increases the cost of collection of rubber, since a larger number of trees have to be tapped for the same amount of rubber. That if it is found necessary to give the trees more room, the cutting out of a portion of them is fraught with much danger to the remainder, inasmuch as each dead rubber tree, root or portion of root, is a potential centre of root disease, and may harbour white ants.

That the spread of fungal and insect disease is helped by the crowding together of the trees.

The advantages claimed for close planting are:—

That it gives for the first years of tapping as much larger yield of rubber. There is not a great amount of evidence on this point, but such evidence as there is seems to point to it being true that a larger yield of latex and of dry rubber can be obtained at any rate in the first three or four years of tapping. It is also claimed that the closeness of the trees more quickly produces shade over the ground and so prevents the growth of weeds. The whole question of weeding is being considered at the present time, and if it is believed that to cover up the ground with a green manure is the best method of cultivation, then the fact that close planting reduces the cost of weeding is of no value.

That in order to compensate for the casual losses of trees, which in the course of time must necessarily occur, more trees should be planted than are wanted. The answer to this is that where trees are planted at large distances, 30 or more feet apart, supplies come on without difficulty, and it is only in crowded estates that difficulty is found in replacing casualties.

To plant more rubber trees than it is intended to permanently keep on the estate, and afterwards by cutting out to reduce the number, is a dangerous policy. No one acquainted with diseases in plants would deny that to leave the dead roots of trees of the same species in close proximity to the roots of living trees is most likely to encourage root fungus and insect pests, while the cost of removing the roots, even if the trees are cut out when quite young, is prohibitive. If a planter finds it necessary to give more growing room—*i.e.*, space for the branches and leaves of some of his trees—it is preferable to pollard some of the trees, and allow them to grow slowly underneath the branches of the unpruned trees, rather than to leave the decaying roots of dead rubber trees, which he has cut down, dotted all over his fields.

COVER PLANTS INSTEAD OF CLEAN WEEDING.

The question as to the relative advantages of clean weeding and the use of cover plants (the use of which has been advocated in my annual reports for the last three years) is gradually being seriously considered by the practical planter, and many thousands of acres of rubber, certainly not less than 15,000, are now cultivated with various cover plants.

It needs but little observation of rubber clearings to decide that an immense amount of top soil, containing a large proportion of humus, has been washed away from sloping land to the detriment, both present and future, of the rubber. An examination of the water in the drains of flat land, which is dark-coloured when the clearing is first opened

and gradually becomes clearer when many tons of water have passed through the soil, will show that this same process of exhaustion of the soil is going on very rapidly on clean weeded flat lands though not to the same extent as on the hillsides.

Most practical planters have observed that the roots of plants in the tropics grow more quickly and vigorously when the earth where they are growing is shaded from the sun, and for this reason the surface of nurseries is covered with a thatch of grass or other convenient covering.

These arguments seem in themselves sufficient to induce a trial of cover plants; but the additional argument that the process of clean weeding is continuous and the most costly of all the work on a rubber estate before it comes into bearing should be a further reason for the adoption of the system of cover plants.

Various cover plants have been used on acreages varying from 400 acres, and practically in all cases with successful results.

It is unfortunate for the increase in the belief in this method of rubber cultivation that a large number of the planters who tried cover plants did so on the weediest and worst-drained parts of their estates. It would be as fair to test a food, which is recommended for supporting working men, on emaciated and abnormally weak persons, and when it did not produce the results hoped for, deeming it a failure.

Another reason for some planters not finding the use of cover plants so perfect a substitute for weeding as they hoped was that cover plant (very often crotalaria) was sown broadcast, and it has been found by experience over large areas that this method of planting cover plants is wasteful and very much less effective than sowing the seed by dibbling, planting in furrows, or similar methods. The loss may be due to the exposure of the germinating seed to the sun, or to its being washed along when the tender rootlets are beginning to form, or birds may eat the seed, but whatever is the cause it is always found that the proportion of the seed-producing plants is very small indeed.

On the other hand, the planting in lines, the seed being slightly covered, results in 80-100 per cent. of the seed producing healthy plants.

In planting cover plant on steep land it is imperative that the lines should follow the contour of the land; when they are made to run up and down the hillside the seed will be washed down with the loosened earth. This results in the seed being massed in one place, and the young plants growing closely together in clumps at the foot of the lines.

The use of cover plants in place of clean weeding is now, after three years' constant advocacy, very generally considered as an economical and practical practice, which I have no doubt will greatly increase when the benefit to the rubber and the saving in expense have been proved on a large number of estates.

The relative advantages of various plants as cover plants for rubber clearings is an important question to decide before proceeding to lay down fields with one or other. Leguminous plants possess the property of increasing the amount of available nitrogen in the soil by means of bacteria living in their roots which obtain nitrogen from the air, and in this respect should be preferred to other plants.

The chief thing to consider in laying down a cover plant is rapidity and cheapnesss in thoroughly establishing it, and if a plant is found to quickly take possession of the soil and cover it to the exclusion of all others, the fact of its not being leguminous should not weigh against it.

The ideal plant for the purpose of protecting rubber land and eliminating or reducing very considerably the weeding bill, is a plant which grows not more than a foot to 18 inches high, is permanent or persistent for three or four years, producing shade over the ground, growing so luxuriantly as to exclude weeds without forming a thick turf, is leguminous, has no thorns or spikes to interfere with coolies working, has no leaves, fruit, or flower which will attract vermin or other animals.

None of the plants at present in use, or being tried in the experimental plots of the Agricultural Department, fulfil absolutely all these requirements, and it is probable that a plant will yet be found better than any at present tried.

The condition on different estates in Malaya do not vary very greatly, but the differences are sufficient to make some places specially favourable to one cover plant and other places to other plants.

In different districts on sloping and flat land with different soils and some estates it is found that in some passion flower will thrive and rapidly cover the land where the sensitive plant or crotalaria do not grow vigorously. On other

places the crotolaria or sensitive plant may do much better than passion flower.

It is easy to decide as to the most suitable plant by planting one or two trial plots. The following plants all have advantages in different ways, and if any one of them can be made to entirely cover the ground in a short time, say four or five months, its acquisition will be a great gain to the estate in improving the growth of the rubber and in reducing the wages bill.

Abrus precatorius, a native of India, where it is used for cover, is leguminous with a free creeping habit; it grows about one foot above the ground, and the branches from one will spread to 15 or 20 feet from the main stem. The pods contain six or eight seeds. The seeds are bright vermillion, about the size of buckshot, with a small black mark at one end; they are used as the karat or standard weight for precious stones and metal in India.

Passiflora fœtida (passion flower creeper), a creeping non-leguminous plant having purple white flowers and yellow fruits about the size of a walnut, grows very freely on nearly all soils and smothers many other plants of a less vigorous habit. This creeper never gets more than about nine inches to a foot high, and very quickly covers the ground. It has to be kept from twining round young rubber plants, but as it is very soft this can be done at extremely small cost. It is a native plant and common all over the Peninsula.

Crotalaria striata and another species of the same genus, *Crotalaria incana*, are leguminous plants, possessing usually very numerous and large bacterial nodules, and growing freely, when not cut, to 7 or 8 feet high. It (*C. striata*) has a yellow flower and a light green leaf, and affords a good cover if not allowed to grow high and scraggy. It should be cut to a height of about 2 feet 6 inches. The cutting is not a costly process, as it is only necessary to slash over the tops, leaving the cut part to remain as a mulch on the soil. The seed is obtainable in almost any quantity as a large acreage is already planted.

Tephrosia purpurea and *T. candida* are both vetch-like leguminous plants which grow freely on almost any soil, and give perhaps a better cover than crotalaria. They must, however, be slashed over at a height of 2-3 feet, and not allowed to run up, otherwise the light, and with it the weeds, will gain an entrance.

Mimosa pudica, the "sensitive plant," a leguminous plant with red spherical flower heads and spiny fruits, is in many ways the most suitable plant as yet tried for cover. The chief reason which makes it disliked by planters is the presence of thorns on its stems which are unpleasant to coolies walking through it.

The habit of this plant of shutting its leaves in heavy rain and at night is an advantage as no rain is lost and dew falls on the ground. It never grows more than about two feet high; it persists and makes a dense cover over the ground when the leaves are not shut, *i.e.*, when the sun is shining and the plant is not disturbed. It is, though a native of S. America, common in all the planting districts and one of the first plants to take possession, and keep possession, of the roadsides.

In addition to these plants I have recently been shown a creeping leguminous plant which was found by Mr. H. F. Browell of Damansara Estate. It is a species of Vigna, having dark green leaves and making a dense cover which refuses to allow any weeds to exist. I have seen a patch of about half an acre on Damansara Estate, and there it appears to be the best plant for the purpose of cover that has been used in the Federated Malay States.

The Future of Rubber.

The Federated Malay States produce about three-fifths of the tin supply of the world, and in a few years' time Malaya should supply a very large proportion of the world's demand for rubber.

In ten years (1919) presuming that 25,000 acres are planted annually during the next five years (a very reasonable estimate, considering that over 40,000 acres were planted during the year in both 1907 and 1908), the rubber trees of the Federated Malay States should yield not less than 50,000 tons of dry rubber, which at 3s. per lb. represent a value of $144,000,000. This amount, should the demand for rubber increase at the rate it has been annually rising for the last nine years, will probably at that time be less than 25 per cent. of the world's consumption.

It is seventy years since the discovery of vulcanisation by Goodyear made rubber available for economic purposes. It is now a necessity of civilised life, and it is only by means of rubber that we can solve the difficult problems of transport and communication. Without it electric wire insulation for telegraphy and lighting, pneumatic and cushion tyres, and the air brakes of railways would all be impracticable; and in the purposes for which it is used in medicine and surgery

it is an absolute essential. The optimistic view that the demand will before long exceed the supply is not more unlikely than the more usual view of the pessimist that the continued planting of rubber will result in a supply larger than the demand, and consequently a considerable drop in prices.

That the market will be overstocked with rubber is still a haunting fear of the owner of rubber property, but as each year brings new uses for rubber, and increases the amount used in directions where its value is already known, the possibility of over-production seems less probable.

Many expert authorities expect that developments in the direction of rubber street-paving, covering for decks of ships, etc., may be looked for in the near future. Some two or three years ago, when I was looking into the question of rubber pavement, I estimated that two-inch-thick rubber of the quality which the London and North-Western Railway had so successfully used in the rubber pavement at the entrance of Euston Station if used for paving the streets of London, which are at present laid with wood or asphalt, would require about 90,000 tons of crude rubber.

If the prophecies so frequently made by experts as to the increase in the use of motor cars are fulfilled, we have another large and increasing demand for rubber of good quality, and wherever the future possibilities of expansion in the rubber market is studied it is found to be more than hopeful. The purposes for which rubber can and will be used economically are unlimited, and we may look forward to a coming rubber age on which all the most suitable rubber planting areas of the world, of which Malaya can claim to be the best, will be required to supply a firm and increasing demand.

Malaya possesses the finest climate in the world for the rapid and healthy growth of Para rubber, and, since millions of acres suitable for this cultivation are still available, there is every probability that this country will be in the future one of the largest producers of rubber in the world.

The fear of over-production is to some extent pardonable on examining the magnitude of the figures relating to rubber planting in Malaya, but a consideration of the possibilities of the world's future requirements takes the student into figures besides which those of Malaya are but small.

THE BRITISH RUBBER FEVER.

(From the *India Rubber World*, Vol. XL., No. 6, September, 1909.)

O furor do plantio en Ceylão continuà na Sua febre ascensional. (The plantation frenzy in Ceylon continues with growing intensity.)—*A Manaos neswspaper.*

The American word "boom" accurately describes the activity of European—and especially British—investors in subscribing to the capital of planting companies in the Far East since rubber reached the unprecedented $2 mark. The *India Rubber World* already has chronicled the payment of dividends of rubber planting companies, in figures as high as 80 per cent. With "consols" at only 2½ per cent., it is not surprising that company promoters should take advantage of the recent successes of some planting companies to part the British fool from his money with rubber as a lure. But every "boom" is followed by a "fizzle," and it is to be feared that the latter term must be applied ere long to some of the recently floated undertakings in rubber planting.

The *India Rubber World* has a list of rubber culture companies registered in London during the month of July, which, while not complete, embraces twenty-four corporations, with an aggregate nominal capitalization of £1,317,040 (=$6,409,375). Now this is a great deal of money, and there is reason to believe that a large part of it actually has been paid over. The new enterprises referred to are planned to do business in nine different countries and colonies; it appears immaterial to the investors where a new company proposes to operate, so long as rubber is mentioned in its prospectus. At the same time, so-called rubber planting companies have been brought out in several other European countries, and in Malaysia, Ceylon, and so on.

Now the large dividends of certain well-established rubber plantation companies in the Far East undoubtedly have been honestly earned. Most of the dividends reported up to date were declared and paid before the late extraordinary rise in the price of rubber; the latter, in fact, not only must be regarded as temporary, but it had nothing to do with the dividends of 50 to 80 per cent. already referred to. But it is a mistake to suppose that, because certain plantations have been successful in producing rubber, every plantation—without regard to soil, altitude or sun exposure—will yield equally good results. There

must be much land planted to rubber to-day which ultimately will be cleared off for another crop to which it is better adapted.

The chief reson for warning, however, relates to the question of profits. Take the Vallambrosa Rubber Company, Ltd., for example. There is a company formed without the agency of the promoter. The owners of three plantations already in existence five years ago "pooled" their interests and formed a limited company, dividing among themselves a certain number of shares, and admitting a few personal friends, with a view to gaining a little needed additional working capital. The total share issue to date is £50,000 (=$243,325). The Vallambrosa company were able in their first year to market rubber, and during four years they have sold 694,078 pounds, for enough to return to the owners £95,000 in dividends, besides which they have the plantation. Being organized solely as a rubber-planting company, all their energies have been devoted to this one object, and each year has shown progress in the direction of economy in the production of rubber, as well as an improvement in its quality.

A dividend of 80 per cent. sounds large; no doubt this year still larger dividends will be recorded. But it must be kept in mind that the only 80 per cent. company to date is practically a private company, capitalized by its actual owners on a conservative valuation of their properties before their yielding capacity was known or suspected. In other words, the "Vallambrosa" enterprise was capitalised practically at cost, by cautious Scotch business men dealing with their own property. How about the newest companies? Have the twenty-four July corporations, with an averaged capitalization of £54,877, any basic properties comparable with those which were at the bottom of the Vallambrosa enterprise? Some of them even have no rubber planted yet. Suppose that, some day, they should be equally successful in growing rubber, what assurance have the public—the owners of the new companies—of 80 per cent. dividends, or 10 per cent., or any dividends at all?

Account must be taken, in this connection, of the promoters—a class of gentlemen who do not appear to have figured in the Vallambrosa organization, but who must, wherever they do appear, be compensated before the public gets a sight of the profits. The Amazon newspaper we quote is right in describing the English attitude toward rubber just now as a "fever." The same view evidently is taken by the London *Financial News*, which, while warmly commending rubber culture in general, says in a recent issue that if rubber were to have a sharp fall, many of those who have been so eager to invest in planting companies "would madly rush into the market and sell their shares," without stopping to find out whether they were really worth holding.

YIELD OF RUBBER.

(From the *India Rubber Journal*, Vol. XXXVII., No. 4, February, 1909.)

We have been asked to give publicity to our opinions on the probable yields of rubber from Para trees planted in the East, in order to enable our readers to gain an insight into the differences in ultimate profits from estates in the Indo-Malayan region. Such a request is easy to make, but the satisfaction of same necessitates the publication of many details. The yield of rubber not only varies according to fertility of soil and climatic factors, but is also to be atributed, in part, to the system of weeding and tapping adopted, to the age of the trees, and the age and thickness of the primary and subsequently formed bark.

Para trees may generally be expected to give larger yields as they grow older, but this is obviously not always the case if one may take the records of some planting companies during the last three years as correct. In one or two instances the decline in yield per tree per annum is due to trees having been excessively tapped on a bad system in the first year; in other cases the roots of the trees have undergone decay in consequence of their being always in contact with brackish water; in others we know that on permanently closely-planted estates the roots of the trees after the seventh or eighth year have not been able to obtain adequate food supplies, owing to the superficial soil being already packed with roots, and that below the first foot being poor in avilable plant food.

Many estates which have shown a conspicuous rise in annual output during the last three years are known. In these instances there has been a gradual increase in size of the trees, the vitality of the plants has shown no appreciable decline, the soil conditions have been improved, there are indications that, with still further economies in management and improvement in collecting and preparation, the yields of the past will

be exceeded with less cash expenditure and a reduction in the amount of bark used up in tapping. Judging from the good results obtained during 1908 there seems every likelihood of our forecasted yield of "one ton per ten acres" being well maintained after the eighth year on most of the well-managed plantations.

TOTAL ANNUAL YIELDS.

The simplest way to deal with this subject is to tabulate the total yields obtained on well-known estates. A few statistics have already been published, and as additional information has now been gleaned, the following statement will be of value :—

	1907. lb.	1908. lb
Anglo-Malay Rubber Co. ...	224,150	349,450
Damanasara (Selangore) Rubber Co.	57,376	124,710
Ceylon Tea Plantations Co. ...	13,426	24,000
Vallambrosa Rubber Co. ...	222,459	262,459
Lingii Plantations, Ltd. ...	110,740	271,500
Bukit Rajah (10 months ending January)... ...	129,100	157,042
Inch Kennet Rubber Estates	—	14,769½
Pataling ...	58,064 (wet)	80,922 (wet)
Consolidated Malay Estates...	63,615	111,585
Rosehaugh Tea & Rubber Co.	153,358	223,470
Selangore Rubber Co. ...	120,524	184,176
Yatiyantota Ceylon Tea Co. ..	5,840	7,500
Panawatte Tea and Rubber ...	67	1,100
Mabira Forest (about) ..	9,600	43,942
Ceylon Rubber Planters ..	45,724	66,597
P. P. K. Ceylon Rubber ...	14,800	129,000
Lanadron Rubber ...	83,953	181,156
Perak Rubber Plants(9 months)	27,427	46,994
Malacca Plantations ..	9,000	46,584
Sumatra Para ...	43,852	64,080
Highlands and Lowlands ...	193,505	210,852
Kepitigala (9 months) ...	28,040	26,120
Golden Hope ...	5,591	15,660
Amalgamated Tea Estates Co., Limited.	7,823	6,000
Anglo-America Direct Tea Trading	23,994	29,600
Bata Caves Rubber Co. ...	4,312	15,010
Consolidated Tea and Lands Co.	5,678	6,100
General Ceylon Rubber & Tea	19,815	25,800

YIELD PER ACRE.

The above list is useful in so far that it shows the progress, in yielding capacity, of the properties owned by different companies. It is, however, not so useful as it might be since it does not afford any definite information of the yield from previously tapped areas, or the actual acreage operated upon. On past occasions most companies have, in their annual reports, given information of the number of trees tapped and therefore of the yield per tree ; the Kuala Selangore, Malay States Coffee, Rubber Growers, Selangore Rubber, and Seramban Estate Rubber Companies have on previous occasions given the yield per acre. In order to show the crops obtained from parts of estates planted at different distances, the Vallambrosa Rubber Co. and Highlands and Lowlands Estates have similarly detailed the yield per acre on small areas. Information of this character is of the utmost value, as it enables investors and buyers to more accurately determine the real position of affairs. We trust that the directors of companies who have bearing estates in their charge will make a point of giving the yield per acre in their annual reports now in course of preparation. The figures may not always appear very attractive when they relate to the yields obtained during the first crop, but they will ultimately be very serviceable, especially when the maximum yield has been attained.

At the present time we are not in possession of reliable information which would enable us to say when a given acreage is yielding the minimum, medium or maximum crop, though this knowledge is, for obvious reasons, desirable. The differences in recorded yields appear enormous, because the number of trees instead of acreages have been usually quoted, the trees being scattered over very large areas. In some cases a yield of 1 lb. per tree has been obtained from trees four years old, but only those familiar with details know that such trees form only a small percentage per acre. It should not be difficult to compile a statement showing the yield and percentage number of trees tapped per acre, each year, until all the trees on a given acreage attain the tappable size, after that period there is no other course open than to record the yield per acre per annum for fields of known age. It is already apparent that some parts of Malaya are probably more favourable for rubber cultivation than others, but information of the annual yielding capacity of mature acreage since the year they were first tapped would reveal the superiority of one district over another, and thus serve a very useful purpose in the event of future extensions being contemplated. This sounds very much like scientific land selection when it is too late ; but to those who take that view we would say that actual results would form the best basis to work upon.

RUBBER.

(From *the Report on the Work of the Imperial Institute*, 1908, July, 1909.)

COUNTRIES OF ORIGIN.—India, Gambia, Sierra Leone, Gold Coast, Southern Nigeria, British East Africa, Zanzibar, Nyasaland, Rhodesia, Transvaal, Cape Colony, Seychelles, West Indies, British Guiana, Portuguese East Africa.

Number of rubbers received in 1908 ... 40
Number of rubbers reported on in 1908 ... 94

The attention which has been devoted to rubber and its cultivation during recent years in nearly all the tropical Colonies and Protectorates shows no sign of diminution, and the number of specimens reported on by the Imperial Institute during 1908 slightly exceeded the figures for 1907. In addition to the examination of samples of rubber much information and advice have been supplied to Colonial Governments, planters, and enquirers in this country on points connected with the cultivation of rubber-yielding plants or with the collection and preparation of rubber.

INDIA.—Specimens of Para, Castilloa, Ceara, and Ficus rubbers prepared in India were reported on during 1908.

Para rubber (*Hevea brasiliensis*).—The specimens submitted for examination were prepared at the Government Experimental Gardens at Kullar and Burliar, in the Nigiri Hills. The rubber from both sources was very satisfactory in chemical composition, comparing favourably in this resepct with plantation Para rubber from Ceylon, but it was rather deficient in strength. The specimen from Burliar was much lighter in colour than that from Kullar, and was consequently valued at a higher price, the quotations being 5s. 4d. to 5s. 5d. per lb,, and 5s. to 5s. 2d. per lb. respectively, with plantation Para biscuits at 5s. 3d. to 5s. 9d. per lb.

Castilloa rubber (*Castilloa elastica*).—Specimens of this rubber were also received from Kullar and Burliar. The rubber from Kullar was of inferior quality on account of the large amount (32·5 per cent.) of resin present. The trees from which the rubber was obtained were, however, only six years old, and it is probable that the quality of the rubber will improve as they become older. The specimen from Burliar contained much less resin than that from Kullar (about 13 per cent.) and was greatly superior in physical properties. It was valued at 3s. 6d. to 3s. 8d. per lb, in London with fine hard Para at 5s. 1d. per lb., whilst 3s. 2d. to 3s. 4d. per lb. was quoted for the specimen from Kullar.

Ceara rubber (*Manihot Glaziovii*).—A specimen of Ceara biscuit from Kullar was of good quality, containing 82·5 per cent. of caoutchouc and exhibiting very satisfactory physical properties. It was valued at 5s. 6d. per lb., with Para biscuit quoted at 5s. 3d. to 5s. 9d. per lb. A sample of Ceara rubber from South Arcot was much inferior in composition to the preceding specimen, containing only 73·7 per cent. of caoutchouc and a high percentage of proteid. It was valued at 2s. 5d. per lb., when fine hard Para stood at 3s. 5½d. per lb.

Ficus elastica Rubber.—Two specimens of this rubber, one in biscuit form and the other in scrap, were forwarded from Mukkie in the Kanoth Range, North Malabar. Both samples contained a large amount of resin and were somewhat deficient in elasticity and tenacity. The biscuit rubber, which was almost black, was valued at 2s. 6d, per lb,, and the reddish scrap rubber at 2s. 11d. per lb., with fine hard Para at 3s. 5½d, per lb.

GAMBIA.—Ths investigation of the rubber of *Ficus Vegelii* from the Gambia has been continued, and during 1908 a small consignment was received for technical trial. The rubber was of resinous nature, containing from 30 to 35 per cent. of resin, but as the result of trials by manufacturers it was found to be suitable for certain technical purposes. The washed rubber was valued at from 1s. 7d. to 1s. 11d. per lb., with fine hard Para quoted at 2s. 9d. per lb.

SIERRA LEONE.—Ten specimens of rubber from Sierra Leone were reported on during 1908; they included samples of Funtumia, Landolphia and Ficus rubbers. The Funtumia rubber was of good quality, the dry product containing 87 per cent. of caoutchouc, but the biscuits were of rather rough appearance. It was valued at 3s. per lb., with fine hard Para at 3s. 5½d. per lb.

A number of samples of Landolphia rubber was examined. The well-prepared rubber was found to be of good quality, containing nearly 90 per cent. of caoutchouc in the dry material, and it was valued at the same price as the preceding specimen of Funtumia rubber.

A specimen of rubber obtained from a species of Ficus was found to contain 37 per cent. of resin, and was therefore of inferior quality. It was very similar

in composition to the *Ficus Vogelii* rubber from the Gambia, and would realise about the same price.

GOLD COAST.—A number of specimens of Funtumia and Landolphia rubbers from the Gold Coast were reported on during 1908.

A sample of *Funtumia elastica* rubber, coagulated by means of an infusion of the leaves of *Bauhinia reticulata*, was received from Ashanti. It was of good quality, containing 88·5 per cent. of caoutchouc, but the sheets were of rather rough appearance and not thoroughly dried. It was valued at 2s. 8d. to 2s. 10d. per lb., with fine hard Para quoted at 3s. 5½d. per lb.

Three other specimens of Funtumia rubber from Ashanti had been prepared by "creaming" the latex. They were of very good quality so far as chemical composition is concerned, containing from 88·5 to 89 per cent. of caoutchouc and low percentages of resin and proteid. The commercial value of the samples was however reduced by the facts that the cakes had been made too thick and contained a considerable amount of moisture; they were also of rather rough appearance. The specimens were valued at from 2s. 7d. to 2s. 10d. per lb., with fine hard Para quoted at 4s. 6d. per lb.

A fifth sample of Funtumia rubber from Ashanti had been prepared in biscuits by the spontaneous coagulation of the latex. It was much less satisfactory in chemical composition than the preceding specimens, containing only 71·5 per cent. of caoutchouc and large amounts of resin and proteid. It was, however, much superior in appearance, and was valued at 3s. 6d. to 3s. 8d. per lb, with fine hard Para quoted at 4s. 6d. per lb.

A specimen of "Pempeneh" rubber, derived from *Landolphia ovariensis* growing in the Northern Territories, was found to be of very good quality, containing 90·6 per cent. of caoutchouc, 6 per cent. of resin, and less than 1 per cent. of proteid. It was valued at 3s. to 3s. 3d. per lb., with fine hard Para at 3s. 5½d. per lb.

Six specimens of latex and two samples of Ficus rubber received from an estate near Axim were examined. The Ficus rubbers contained 22 and 27 per cent. of resin, and were, therefore, of inferior quality. Samples of Ficus latex which were stated to correspond to the specimens of prepared rubber were found to yield products of similar character. A specimen of Landolphia latex, probably from *L. ovariensis*, yielded rubber of good quality, but the other latices, stated to be derived from species of Landolphia, Tabernaemontana and Anthostema, and from *Funtumia africana* furnished resinous products of no commercial value.

A substance resembling gutta percha, derived from the rhizomes of a plant occurring in the Colony, was also investigated.

SOUTHERN NIGERIA.—A number of specimens of *Funtumia elastica* rubber prepared in biscuits or sheets have been received for examination and valuation in comparison with the ordinary lump rubber as prepared by the natives. One sample, described as "Anyo" rubber, was in the form of dark-coloured biscuits which had been imperfectly dried, and consequently arrived in a mouldy condition. The rubber was of good quality, containing 86·5 per cent. of caoutchouc, and was valued at 2s. 6d. to 2s. 8d. per lb., with fine hard Para quoted at 3s. 5½d. per lb. Samples of Benin lump rubber sent at the same time were valued at from 1s. 6d. to 1s. 11d. per lb.

Three further samples of Funtumia rubber in biscuit form were forwarded from Benin City. They were of satisfactory composition, containing from 87·9 to 89·8 per cent. of caoutchouc, but were of very rough appearance. They were valued at from 2s. 8d. to 3s. 4d. per lb., with fine hard Para at 4s. 6d. per lb., and Benin lump at 2s. per lb.

A specimen of "Ubabikpan" rubber derived from *Clitandra elastica* was found to be of very good quality, containing 90·4 per cent. of caoutchouc, whilst the percentages of resin and proteid were low. It was valued at 2s. 8d. to 2s. 10d. per lb., with fine hard Para at 3s. 6d. per lb.

A sample of rubber derived from the Marodi vine consisted of a thick rough biscuit of brown rubber, dry and well prepared. It contained over 80 per cent. of caoutchouc, but a rather large amount of proteid. It was valued at 2s. 6d. per lb., with fine hard Para at 3s. 1d. per lb.

A specimen of rubber believed to have been prepared from *Ficus elastica* was found to be very satisfactory in chemical composition, but deficient in physical properties. On the latter account its commercial value was only low.

EAST AFRICA PROTECTORATE.—The examination of a small ball of Ceara rubber from the Kibos district showed that the percentages of resin, proteids and in-

soluble matter were all rather excessive. It was valued at about 3s. per lb., with fine hard Para at 4s. 3½d. per lb.

ZANZIBAR.—Small samples of Para and Castilloa rubbers experimentally prepared in Zanzibar were received for examination.

The Para rubber was of very good quality but contained a fair amount of vegetable impurity and a little more resin than usual.

The Castilloa rubber was of very resinous nature containing only 77 per cent. of caoutchouc and 20·5 per cent. of resin. No information was available as to the age of the trees from which the specimen was obtained. The samples were too small for valuation.

CAPE COLONY.—A specimen of coagulated latex received from Cape Colony was found to contain 64 per cent. of resin, and would, therefore, have very little, if any, commercial value. It was probably derived from a species of Euphorbia.

RHODESIA.—A sample of Ceara rubber from North Eastern Rhodesia proved to be of inferior quality on account of the large percentage of sand which it contained; otherwise it was of normal composition. It was valued at 1s. 8d. per lb., with fine hard Para at 3s. 5½d. per lb.

A specimen of so-called rubber was also received from Southern Rhodesia. It proved to be a resinous product, resembling the material obtained from species of Euphorbia in South Africa.

SEYCHELLES.—Specimens of Para and Vahea rubber were received from Seychelles for examination.

The three samples of Para rubber were obtained from a small number of trees under five years old, but of considerable size. The rubber was very satisfactory in composition, comparing favourably in this respect with Para rubber from Ceylon and the Federated Malay States, but was deficient in strength. The latter defect was probably chiefly due to the fact that the rubber had been obtained from young trees. From the results of the chemical examination, however, there appears to be every likelihood that the Para trees in Seychelles will yield excellent rubber as they become older.

The Vahea rubber, derived from a climbing plant introduced from Madagascar was of good quality, the best specimen containing 91 per cent. of caoutchouc, but the cost of preparing the rubber in a clean form is practically prohibitive.

JAMAICA.—A sample of the rubber of *Forsteronia floribunda*, a climbing plant occurring in Jamaica, was found to be of good quality, containing 88·8 per cent. of caoutchouc. It was valued at 2s. 4d. per lb., with fine hard Para at 3s. 5½d. per lb.

BRITISH GUIANA.—The rubber obtained from *Sapium Jennani* in British Guiana has been carefully investigated in order to determine its composition and value. A number of specimens, in the form of biscuits, scrap block, and ball, have been analysed, and the results show that the rubber is of very good quality so far as chemical composition is concerned. The percentage of caoutchouc recorded range from 87 to 92 per cent., and of resin from 2·0 to 4·2 per cent.; the best specimen contained 92·4 per cent. of caoutchouc, to 2 per cent. of resin and 2·8 per cent. of proteid. The following valuations were obtained: Scrap block from 2s. 4d. to 3s. per lb.; balls 2s. 6d. per lb.; and the best biscuits 3s. 6d. per lb., with fine hard Para at 3s. 5½d. per lb. There is, therefore, no longer any doubt that the rubber yielded by this tree is of excellent quality if carefully prepared.

A sample of Balata from British Guiana was of very good quality, containing 50·7 per cent. of gutta and 44·8 per cent. of resin. The percentage of gutta is higher than that usually recorded for Balata. The specimen was valued at 2s. 2½d. per lb. The latex of the Bastard Bullet tree was found to yield a product containing 70·6 per cent. of resin, therefore differing widely in composition from true balata.

PORTUGUESE EAST AFRICA.—Specimens of Ceara, Landolphia, and Mascarenhasia rubber from Portuguese East Africa proved to be of good quality, whilst the products obtained from *Ficus sp.*, *Landolphia florida* and *Diplorrhynchus mossambicensis* were of resinous nature and of little or no value.

An examination has also been made of Bitinga tubers (*Raphionacme utilis*) and the rubber they furnish. The partly dried tubers as received contained from 1·10 to 1·5 per cent. of rubber, corresponding to a yield of 9·3 to 11·6 per cent. from the dry material. The sample of prepared rubber was of very fair quality, but was rather sticky and contained a considerable amount of vegetable and mineral impurity. Trials are being made to ascertain whether the tubers of this plant, which is stated to flourish on poor soils not adapted to other rubber plants, can be profitably utilised as a source of rubber.

THE ADVANCE IN RUBBER.

(From the *Chemist and Druggist*, Vol. LXXV., No. 1, 543, August 21, 1909.)

In view of the remarkable advance in the price of raw rubber, we have made inquiries as to what effect this is having upon the prices of the finished products handled by chemists and druggists. The extracts from manufacturers' and dealers' letters, which we print on another page, show how the matter stands. It will be seen that the advance in most instances varies from 5 per cent. to 15 per cent., according to the class of goods, and if the market for rubber should further advance, it is quite likely that prices will have to be again adjusted. Up to the present buyers are still at an advantage, as the advance in raw rubber is not yet fully reflected in the finished article; but when makers' stocks on hand have been worked off, and if the advance on raw rubber is maintained, further increases may be looked for. Judging from the tenor of the letters we have received, it would appear that there is an unsettled time ahead for the makers of rubber goods, who are compelled to face an enormous advance in raw rubber without a compensating advance on finished products. In 1903 and 1904 there were three advances each of 10 per cent. on the part of manufacturers, but on the present occasion the advance is phenomenal and more pronounced. This may be judged from the fact that in February, 1908, fine hard Para rubber was selling at 2s. 9d. per lb. on the spot, whereas to-day it is worth 8s. 3d. July was an exciting month, prices commencing at 6s. 6d. and closing at 8s. 4d. They dropped to 8s. early this month, but this was merely temporary, and the market has again advanced to 8s. 3d. rate. How long these high prices are expected to rule it is impossible to state. In certain quarters the opinion is held that they must rule for many months to come, some brokers believing that 10s. will be reached. As it is, forward business for 1910 is being done at about 1s. per lb. below current rates; on the other hand, the opinion is expressed that a decline of 2s. to 3s. per lb. may take place shortly, but even well-informed brokers are not in a position to judge. Meanwhile, there has been a remarkable boom in the flotation of new rubber companies, July alone establishing a record with twenty-three companies, involving capital of over £1,860,000. These concerns are getting to work as quickly as possible, and future supplies, say, within the next four or five years, are bound to be materially increased, judging by the acreage devoted to rubber in the East, where it is estimated there are 600,000 acres now under cultivation.

Such a high figure as at present prevails for rubber is undoubtedly detrimental to the best interests of makers, whose trade in the present famine tends to disorganisation, as naturally retailers do not care to stock high-priced goods which are liable to violent fluctuations. The public also object to pay the higher prices; but it should be explained to them that the present rise is unprecedented, and that when reduced prices again prevail for rubber, they will have the benefit. In the present market conditions chemists would be well advised to cover their winter requirements early. It need hardly be said that the development in the motoring and cycling industries is responsible for the greatly increased demand for rubber, and these large users are the first to feel the pinch. Some of them maintain that the abnormal advance is not due to natural fluctuations of supply and demand, but to internal and artificial manipulation of the market. Consequently they deprecate this interference with the flow of raw materials, resulting in loss and inconvenience to themselves and customers. The same remarks apply also to rubber druggists' sundries makers, who no doubt would like to see prices at round about 4s. per lb. We understand that German rubber manufacturers have raised their prices from 10 per cent. to 15 per cent. on surgical articles of soft rubber in order to avoid making any alteration in quality.

OILS AND FATS.

OILS AND OIL-SEEDS.

(Report on the Work of the Imperial Institute, 1908, No. 601, July, 1909.)

COUNTRIES OF ORIGIN.—Sudan, British East Africa, Uganda, Rhodesia, Transvaal, Sierra Leone, Gold Coast, Southern Nigeria, Northern Nigeria, India, Federated Malay States, West Indies, British Guiana, Australia, Fiji, Portuguese East Africa, Mexico.

No. of oils and oil-seeds received in 1908 ... 66
No. of oils and oil-seeds reported on in 1908... 53

FRUITS AND SEEDS OF BALANITES AEGYPTIACA.—A sample of "Heglig" (*Balanites ægyptiaca*) fruits was received from the Sudan. The oil from the seed-kernels was regarded by experts as equal in value to refined cotton-seed oil, but the commercial prospects of the fruits were not considered to be very favourable, owing to the difficulty of extracting the kernels. The latter would probably be worth about £5 or £6 per ton. Samples of the oil and seed from Northern Nigeria were also examined. As the oil of *Balanites ægyptiaca* is reputed by the natives of Uganda to be of value as a remedy for sleeping sickness, specimens of the fruits and oil were submitted to pharmacological tests, which, however, gave negative results.

FRUITS, SEEDS, AND OIL OF BASSIA SPP.—Samples of the fruits, seeds, and fat of *Bassia latifolia* and *B. longifolia*, and of the seeds and fat of *B. butyracea* from India were examined, and results were obtained which were fairly in accord with those of previous observers, and showed that the fats would be of value for edible use or for soap-making.

BEESWAX.—Samples of beeswax from the Sudan and the Gold Coast were examined and found to be of good quality.

SEEDS OF CARAPA SPP.—Seeds of *Carapa procera* from Sierra Leone were found to yield an oil which was valued at £20 10s. per ton, whilst the seed-kernels were regarded as worth about £10 per ton.

A sample of the seed of *Carapa grandiflora*, from Uganda, furnished an oil valued at £24 to £26 per ton. The seed-kernels were considered to be worth £5 to £6 per ton, assuming that the cake could be sold at £2 per ton.

CASTOR OIL SEEDS.—Castor oil seeds from North-Western Rhodesia were of good quality, and were regarded by manufacturers as worth 5s. per ton more than East Indian castor seed. At the end of the year, three samples from Fiji were under investigation.

DIKA NUTS.—Five samples of Dika nuts were received from Southern Nigeria. Experts reported that the fat obtainable from these seeds possesed a value equal to that of palm-kernel oil (£27 5s. per ton), and stated that Dika kernels would be readily saleable. Unfortunately, however, the nuts do not appear to be obtainable in large quantities at a low cost.

LOPHIRA ALATA SEEDS.—Three consignments of the seeds of *Lophira alata* were received from Sierra Leone. The oil was valued by experts at £1 or £2 per ton in advance of cotton-seed oil.

MAFOUREIRA SEEDS (*Trichilia emetica*).—Samples of Mafoureira seeds were received from the Transvaal and Portuguese East Africa. The seeds were submitted to experts for technical trial. The fat, however, proved to be dark coloured and difficult to bleach, and was therefore unsuitable for the better qualities of soap, and would only realise the price of a "soft, off-coloured tallow." The cake is unsuitable for feeding purposes, as it is bitter, and probably emetic. A price of £9 5s. per ton has been offered for the seeds in this country.

OMPHALEA MEGACARPA SEEDS.—The seeds of *Omphalea megacarpa* were found to yield a pale yellow, faintly bitter oil, which is less viscous than castor oil and differs to some extent in its chemical constants. The pharmacological activity of the oil has been studied by Professor Cash, F.R.S., who regards it as a valuable, non-irritant cathartic.

PARA RUBBER-SEED OIL (*Hevea brasiliensis*).—Samples of Para rubber seeds and oil were received from the Federated Malay States. The results of their examination confirmed the opinion that the oil could be used for the same purposes as linseed oil. A ton of oil, or five tons undecorticated seeds, was requested for technical trials on a manufacturing scale.

PYCNANTHUS SEEDS AND "MACE."—Samples of the nuts and mace of *Pycnanthus Schweinfurthii* were received from Uganda. The seed-kernels yielded a dark brown, solid fat, which would need to be refined before it could be used for soap-making. A firm of soap manufacturers reported that probably the nuts could not be utilised commercially unless they are obtainable in

very large quanitities at a low cost. The "mace" furnished a dark orange-red oil, which can only be decolorised by means of alkali, involving the removal of the large amount of free acids present, and it therefore seems unlikely that the mace could be used commercially as a source of oil.

RICINODENDRON HEUDELOTII SEEDS.—These seeds from Southern Nigeria were found to furnish a rapidly drying oil. A consignment was submitted to a firm of varnish makers, who made careful technical trials with the oil, and arrived at the conclusion that its properties are intermediate between those of Tung oil and linseed oil, and that it would be suitable as a substitute for the former. It appears somewhat doubtful, however, whether the collection and exportation of the seeds would prove remunerative.

Among other products examined, may be mentioned Shea butter-nuts from Sudan, seeds of *Croton macrostachys* from Uganda, sesame seed from Rhodesia, seeds and fat of *Pentadesma butyracea* from Sierra Leone, "Ikpan" seeds and the berries and oil of a Sapindaceous plant from Southern Nigeria, groudnut oil from Northern Nigeria, *Amoora Rohituka* oil from India, vegetable waxes from South Africa and Mexico, and "M'Fucuta" seeds from Portuguese East Africa.

Summaries of reports of the investigations of various African oils and oil-seeds have been published in the "*Bulletin of the Imperial Institute*," 1908, VI., 243, 353.

The following investigations were in progress at the end of the year:—The examination of twenty samples of palm fruits and oil of different varieties from the Gold Coast; specimens of "ben" oil seeds from Northern Nigeria; and seeds of *Pentaclethra macrophylla* from Sierra Leone and Southern Nigeria. A study was also being made of the production of stearin from Indian cotton-seed oil, and, in connection therewith, a comparative examination of Indian "ghi" from buffaloes' and cows' milk was being carried out.

VOLATILE OILS.

COUNTRIES OF ORIGIN.—Cyprus, Uganda, Gold Coast, Seychelles, Ceylon, India, Fiji, Bermuda.

No. of volatile oils received in 1908	... 59
,, of volatile oils reported on in 1908	... 10

The volatile oils received during the year consisted mainly of "grass oils," such as "lemon grass" and "citronella," turpentine oils, origanum and majoram oils.

LEMONGRASS OILS.—These were received from Uganda, Ceylon, Fiji, and Bermuda. Both the Bermuda and Uganda oils were somewhat low in citral, the principal odoriferous constituent of lemongrass oil, and were, consequently, of small value. Unfortunately, the market for lemongrass oil was for the greater part of the year so overstocked that this oil was practically unsaleable.

CITRONELLA OILS.—A sample of this was received from the Gold Coast. It was of rather abnormal character, and information as to its botanical origin is being sought.

A very complete series of "grass oils" has been received from Ceylon and is at present under investigation.

OILS FROM ORIGANUM SP.—These were received from Cyprus. They included two samples of origanum oil, portions of consignments offered for sale in London by the Government of Cyprus. The samples were of the usual good quality, and contained about 80 per cent. of carvacrol. It has been ascertained that better prices might be obtained for this origanum oil in commerce if it were rectified so as to remain colourless when kept. A process of rectification was devised during the year, and this will be tried on a large scale in Cyprus in the coming season, and for this purpose a modern rectifying still is being specially constructed in London.

The preparation of pure carvacrol, on a commercial scale, from this oil has also been suggested to the Government of Cyprus, and a small trial consignment of this carvacrol has been sold recently to a London firm. Cyprus marjoram oil is being completely investigated with a view to ascertaining whether it is identical with the sweet marjoram oil of commerce. The exact botanical origin of each of these oils has not yet been settled, and this point is being investigated at the Royal Gardens, Kew.

TURPENTINE OILS.—These were received from India. A full investigation is being made of these oils in comparison with American, French, and Russian turpentine oils.

VARIOUS OILS.—These included laurel oil from Cyprus, which proved to be of excellent quality, and bay oils from Fiji, which are still under investigation. Among products yielding aromatic oils on distillation, were clove leaves from Seychelles, which furnished 4·5 per cent. by weight of the clove-leaf oil referred to in the Report on the work of the Imperial Institute in 1906 and 1907 (p.61), and *Chlorocodon* roots from Uganda, from which a new aromatic isomeride of vanillin was isolated.

SOY BEAN TRADE IN CHINA.

(From the *Indian Trade Journal*, Vol. XIV., No. 170, July 1, 1909.)

Attention is called by the United States Consul at Newchwang to the exports of Chinese beans to the United Kingdom, which are expected to develop into a considerable trade and which are competing seriously with Indian linseed and cotton seed in home markets. Since the closing of the river to navigation, he says, large numbers of carts have been entering the town with inland produce, and great quantities of beans have been stored for export in the spring. It is difficult to obtain reliable figures concerning the quantity brought by rail, but it is estimated that the total quantity brought in by rail and carts during the four months December-March will reach 88,000 tons, against 30,000 tons for the same period last winter. This quantity, however, is small compared with the stocks shipped to Dalny by rail from the north, and when the thaw sets in putting a stop to cart traffic, unless there are early spring rains, there is very little prospect of large supplies coming down by river boats, as the snow thus far has been insufficient to give the requisite draft of water in the up-river reaches. Beans, bean cake, and bean oil are the principal products of Manchuria. The prices of these during the past season have been higher than ever before, but how much of this is due to the ability of Japan, a gold-standard country, to pay more in silver, because silver has been cheap, cannot be positively stated.

The bean cake and bean oil go chiefly to Japan, but shipments have gone to England, France, and the United States, during the past year. The American shipment was a small quantity sent from Newchwang merely as a sample. During the year the exports to England amounted to about 70,000 bags. This is a new development said to have been brought about by English experts who have made a study of the beans. They have discovered, it is said, a means of extracting an oil therefrom, for culinary use as well as for lubricating purposes, the residue being converted into cattle feed. The exports of bean cake from Newchwang to foreign countries in 1908 amounted to 246,608 tons. The exports of beans from Newchwang to foreign countries and other Chinese ports during 1908 were as follows, in tons: Black beans, 16,498; green beans, 31,873; white beans, 4,315; yellow beans, 75,996; red and small green beans, 3,631; total 132,316 tons.

Mr. Consul F. W. Playfair, in his Report on the Trade of Nagasaki for the year 1908, gives the following details about soy beans and their products :—

The largest increase under any heading is that of the import of oil cakes for manure, which is £83,485, an advance over 1907 or more than 60 per cent. The reasons for this increase are (1) the extremely low price of bean cake in China, and (2) the increase in the area under cultivation. The bean cakes come from Newchwang and Dalny; rape-seed cake from Shanghai, the collecting centre for Yangtsze River ports. The import of rape-seed cake during 1908 was very considerable. It is used principally for tobacco plantations.

In a report to his Government the Japanese Consul-General in Mukden says :—"The season for the export of beans and oil cake, the principal staples of Manchuria, opens in November and closes in March or April, and the destinations are chiefly Japan and other parts of China (Central and South). Lately beans have begun to be exported to Europe. During November last 21,804 piculs(=133⅓ lbs.) were shipped to Liverpool, where they are chiefly used as an ingredient in the manufacture of soap. The cake remaining after the oil is squeezed out is used to feed cattle. In December last 152,357 piculs were exported to Europe, half the quantity being shipped for England and the other half to Belgium and the Netherlands, it being used in the manufacture of soap as in the case of Liverpool. The export of beans to Europe has an excellent outlook.

Owing to this increased export to Europe the price of beans is being forced up; nevertheless, it is expected that even larger quantities will be shipped during the present year.

Mr. Consul Pitzipios, in his Report on the Trade of Chinkiang for the year 1908, states that the exports of bean cake in that year amounted to 588,123 cwts. He adds that this cake is produced very cheaply and goes principally to Japan.

DYES AND TANS.

TANNING MATERIALS.

(From the Report on the Work of the *Imperial Institute*, 1908, No. 601, July, 1909.)

COUNTRIES OF ORIGIN.—British East Africa, Natal, Northern Nigeria, Gold Coast, Gambia, India Portuguese East Africa.

No. of tanning materials received in 1908 ... 16
,, ,, ,, reported on in 1908 ... 18

The tanning materials examined during the year belong to three groups :—

1. MANGROVE PRODUCTS.—Three mangrove barks, from Portuguese East Africa, were found to contain 23·3, 28·3, and 41·76 per cent. of tannin. The samples were of special interest, because No. 2, on further examination, was found to contain 39·8 per cent. of tannin in the inner bark, and only 8·97 per cent. in the outer bark, clearly illustrating the desirability of scraping the outer layers off mangrove bark before shipment. A mangrove bark from the Gambia was of exceptional interest in yielding a very light-coloured leather, but unfortunately it contained only 25·7 per cent. of tannin.

The enquiry on the manufacture of Indian mangrove extracts, referred to in the Report for 1906-7 (p. 67), was completed during the year. Mangrove leaves from British East Africa were also examined, but proved to contain too little tannin and too much salt to be of valne as a tannin agent.

2. WATTLE BARKS.—A number of enquiries have been received relating to this product during the year, and information has been furnished to the Government of Natal respecting machinery and processes for making wattle extract, and also regarding the competition of other tanning materials with wattle bark in the United Kingdom. Six samples of wattle bark were examined for the Natal Government, mainly with a view to ascertaining the influence of the situation of a wattle plantation on the bark produced. These results are summarised *inter alia* in articles in the "Bulletin of Imperial Institute," 1908, VI., 157, and 417.

CAESALPINIA PODS.—"Divi-divi" pods from the Gold Coast proved to be not well prepared and deficient in tannin. Further supplies of "teri" pods were received from India during the year, and were submitted to commercial firms for trial and valuation,

ACACIA PODS.—*Acacia arabica* pods from Northern Nigeria were found to contain 26·6 per cent. of tannin.

Full particulars regarding most of these tannin materials and of others investigated at the Imperial Institute in recent years are given in reports and articles published in the "Bulletin of the Imperial Institute," 1907, V., 343, 1908; VI., 121, 167, 175, and 417.

NATURAL DYESTUFFS.

(From the Report on the Work of the *Imperial Institute*, 1908, No. 601, July, 1909.)

COUNTRIES OF ORIGIN.—Northern Nigeria, Scuthern Nigeria, Sierra Leone, India, Jamaica.

Number of dyestuffs received in 1908 ... 17
,, ,, reported on in 1908 ... 15

Natural dyestuffs are now of so little importance in commerce that their investigation is generally of more purely scientific than practical importance. There are, however, still a few natural dyestuffs which for certain purposes have not been entirely supplanted by aniline and other artificial dyes. Among the most important of these are logwood, camwood, annatto, quercitron bark and natural indigo, and enquiries relating to, or samples of, all these products have been dealt with in the course of the year. There has been some revival of interest in Indian indigo, chiefly on account of the planting experiments with Natal-Java indigo, which have been carried on during the last few years in India. This species furnishes a superior yield of indigo, and a number of enquiries on the subject were dealt with. Owing to a failure in demand for Jamaica logwood, enquiries were received from that island as to the markets and prospects for this wood in Europe, and a memorandum on the subject was prepared, and enquiries were placed in a position to negotiate directly with consumers in this country.

Other enquiries dealt with the method of formation of the red-colouring matter in camwood, the preparation and valne of quercitron bark, and the identification of samples of saffron.

An interesting series of materials used in tanning and dyeing the native leather of West Africa was received during the year, and a full account of these, with details of the method of using them, was published in the "Bulletin of the Imperial Institute," 1908, VI., 175.

FIBRES.

REPORT ON PROGRESS OF COTTON GROWING AT THE COAST.

BY T. H. ROBERTSON.

(From the *Agricultural Journal of British East Africa*, Vol. II., Part I., April, 1909.)

To describe in detail what has been accomplished in the direction of the development of Cotton Growing in East Africa would entail an enormous amount of labour, and serve no purpose, and it is therefore intended to deal with only the main facts.

It is felt that a sensible stimulus has been given to the Cotton Growing industry, and in this connection the coast belt has risen to the occasion in a very marked manner.

The Planters (Europeans) have been urged not to be misguided by the prospects of large profits, but in the words of Sir Alfred Jones they have been advised to work economically, work perfectly, and with close and careful study of the plant and success is sure to follow.

It is a matter of regret that the climatic conditions of 1907 were so unfavourable, the rainfall was very short, and the harsh cutting winds of October and November did an immense amount of damage to the then maturing bolls, and as these conditions prevailed right up to Christmas and even into January and February, the second pickings were practically nil.

During the fruiting periods short heavy rains injured the bolls causing many to fall to the ground.

There seems no doubt, however, that should the planters and natives show the same enterprise and courage in the future as they have done in the past, cotton cultivation will become established on the coast on the only possible permanent basis—a remunerative business to all cultivators.

Early Difficulties.—The early difficulties were very numerous and large sums of money for educational work had to be expended.

A system of cultivation and other details gave much trouble, but the experiments of the Department of Agriculture from the earliest days particularly fostered the industry and rendered assistance in various ways.

First Experiments.—The first experiments with Cotton by the British East Africa Corporation were carried out last year.

Several kinds were tried, including varieties of Egyptian as well as one variety of American.

Samples of these cotton were submitted for examination, and the following reports show with what promise of success:—

No. 1. ABASSI.—Grown on the British East Africa Corporation's Experimental Farm at Malindi, from seed imported direct from Egypt.

Area one acre, seed sown 24th April, crop harvested up to 28th Febuary, 1908, yield per acre 497 lbs.

On ginning the sample yielded 32 per cent. of clean cotton.

The commercial experts reported that the lint possessed all the characteristics of abassi, was clean and good quality but of somewhat short staple.

No. 2. AFIFI.—Seed sown 26th April, 1907, crop harvested up to 28th February, 1908, yield per acre 580 lbs.

On ginning the sample yielded 32 per cent. of clean cotton.

The commercial experts reported that the cotton possessed the character of brown Egyptain, slightly stained, staple fair length and fine and soft to the touch.

No. 3. AMERICAN RICHMOND.—Seed sown 8th May, 1907, crop harvested up to 28th February, 1908. Yield per acre 486 lbs.

On ginning out the sample yielded 28 per cent. clean cotton.

Colour white, moderate staple, clean and free from stain.

No. 4. SEA ISLAND.—Grown close to Mombasa about 12 miles from the sea and about 400 feet above the sea level.

The British Cotton Growing Association in writing stated that Sea Island Cotton should not be grown on the mainland away from the sea, and they further reported that sample submitted was deeply stained, staple soft, and to a large extent perished. No use for Sea Island purposes. Seed appears to be perished.

A further experiment was tried by Mr. Davis of Malindi, on an isolated patch of a variety named Payata, and the following is the report of brokers:—

Dull, semi-rough, suitable as substitute for Peruvian, staple irregular 1 to 1¼, sample too small for close valuation.

Probably worth cultivating if fair yield results.

In a consignment of twenty bales of Afifi clean cotton, grown at Mombrui by natives, the following has been submitted for report:—"Afifi character, clean and free from stain, staple fair length, and strong. It is a fair regular brown."

These experiments therefore show that Egyptian cotton gives most promise of success.

Development.—The history of the industry on the coast is one of steady, continuous progress, as the table showing the cotton export indicates.

In the present year (1908) it comes well to the front as the staple crop on the districts of Malindi and Mombrui, and promises to remain so if insect pests can be kept in check.

Important developments by Europeans have occurred, and the progress recorded in 1906 has been surpassed in 1907.

Large areas of cotton have been grown, and the industry is now established on a permanent basis.

The progress made in this country is interesting, and the statistics of the value of cotton and seed exported from the Colony during the past three years will show this.

Native Cultivations.—So far as native growing is concerned, the conclusion forced on any practical observer is that before the cultivation of Egyptian cotton is put on a sound firm basis and is extended, the standard of cultivation must be vastly improved and also the causes which underlie this want of system must be remedied.

Apart from constant European supervision on the native shambas, it is considered that the publication of leaflets in the vernacular and the establishing of local shows would tend to remedy the defects.

So far as the work of the British East Africa Corporation is concerned, it is too well known to make it more than necessary to merely mention it here.

Almost every shamba holder in the coast has been visited, and his land inspected and practical advise given on the spot.

On the Tana river special efforts have been made to develop the industry, and a hearty response has been given by the natives, although the output this year will not be large.

Further efforts in this direction are being made, and as the administration extends its control, and consolidates its influence, the natives will come to understand Europeans and their methods better and better, and thus help to extend development.

In the district of Lamu there are at present about 1,000 natives growing cotton to about thirty last year, and the percentage in the Malindi district is much larger.

The question will naturally be asked—"*Is Cotton Growing a source of profit to the native,*"—and the answer is unhesitatingly and emphatically in the affirmative. From keen personal observation the writer has proved, crops, such as Sim Sim, Matama, etc., do not leave anything like the profit to the native on the coast that cotton does, and as improved methods of cultivation take place and under favourable weather conditions, the native will produce his cotton with greater economy and probably with more profit than previously.

At present, unless in the event of total failure, the native stands on velvet.

He is guaranteed a market and a minimum price for his output, he is helped financially and practical advice given free of charge, and he is therefore quite independent of what the fluctuations of the home market may be—and these have not been pleasant reading recently.

In April last the writer had the honour of conducting His Excellency the Governor over the British East Africa Corporation's Malindi Ginning Factory, and he then expressed his astonishment and admiration at the development and the work being carried on.

Insect Pests.—Large quantities of Paris Green were distributed in all directions, free, with beneficial results.

The cotton work can be readily held in check by the use of Paris Green or similar arsenical insecticide, and leaf blister mite can be controlled by timely hand picking of diseased leaves and application of Sulphur and Lime to affected plants.

There is no doubt when cotton growers become accustomed to the use of these remedies and are favoured with more propitious weather, attacks would be much mitigated if not entirely suppressed.

Preparations have been made to hold large supplies of sprayers, insecticides and fungicides, in order to combat disease in its initial stages.

Rotation of Crops.—One of the chief defects of East African cultivation is the want of system of rotation of crops to maintain and restore the fertility of the soil.

At present we have practically no supplementary crops to use in rotation with cotton, if we except groundnuts.

Every endeavour is being made to induce growers to adopt a system of rotation, and groundnuts especially would answer the purpose, and have been recommended.

The leafy material should be buried as soon as convenient after the crop has been gathered. Treated in this way it soon decomposes and greatly benefits the soil.

Without such assistance the land is like a whip to a willing horse, becoming weaker through overwork.

Practices doubtless vary in different parts of the Colony, although they are mainly conducted on the exhaustion principle.

In Egypt *Bersim* or *Egyptian Clover* is the great leguminous forage crop, and what that country would do without it, it is difficult to conjecture.

The Cotton of Egypt is famous for its quality and yield, but to a large extent to the excellent physical and chemical condition of the soil, produced and maintained by the extensive cultivation of *Bersim.*

Labour.—There is practically no skilled labour, but with the crude system of cultivation in force it meets requirements.

At certain times of the year it is difficult to find sufficient labour—the commercial development of East Africa and the numerous improvements which are being effected attracted a considerable amount of labour which would otherwise be employed in Agriculture, and a rise in price of labour has taken place during the past two years, which is likely to continue in the future.

Seed Selection and Seed for Planting.—Specially selected imported seed has been for past two seasons placed at the disposal of planters and natives without charge, but this system cannot continue indefinitely.

The British East Africa Corporation have expended large sums in importing seed from Egypt, but now every endeavour must be made to enable us to become self-supporting.

The selection of good seed for sowing is as it were the very starting point in the successful raising of crops.

No farm practice is attended with more beneficial results, and this is even more true in the case of the cotton plant.

That selection is one of the most important factors in the improvement of any plant is undoubted.

Much of this work in England is carried on by the Seed Merchant class, which is entirely wanting in East Africa.

These merchants are specially qualified by profession to meet the requirements of land-owners, by supplying them with pure strains of any variety of farm seeds, and thus cultivators, if not satisfied with the strain of their own produce can purchase from such merchants the seed they require.

These merchants are in fact experts, who devote the whole of their energies to the production of suitable varieties of seeds, and carry on a work which is beyond the scope of the ordinary cultivator.

As far as Cotton seed is concerned in East Africa, we are now entirely dependent on the owners of ginning establishments, and to obtain absolutely pure seed is an impossibility at present, whatever price one may be prepared to pay for it.

The remedy is the establishment of seed selection farms on the alluvial soils of the Coast, and to aim at, (1) longer staple, (2) uniformity in length of fibre, (3) strength of fibre, (4) a greater yield in lint and seed.

It may be noted casually that hardly a century ago English farmers were most ignorant of what science could do for them. During the period of some twenty years, early in the 19th century, great progress was made and has been continued.

We may possibly look in time for a similar record of progress in East Africa in seed growing and in other agricultural improvements.

Ginners.—Starting in 1906 with one Ginnery of six gins, generously placed at the disposal of the Agricultural Department by the British Cotton Growing Association, the British East Africa Corporation have now three Ginneries established and working twenty-five gins, and further development in this direction is contemplated.

It may be mentioned here that by order of the Directors of the British East Africa Corporation the writer was deputed to proceed to Egypt with a view of collecting information, which would prove beneficial to East African cotton growers, and the trip was in every way a successful though costly one.

The following statistics should prove interesting:—

The samples referred to are at present in the hands of the Uganda Government for purpose of exhibition at the Kampala Agricultural Show, but they are at the service of the East Africa Government if so desired.

"At the present time the varieties that are chiefly grown in Egypt are:—

"Ashmouni in Upper Egypt.
"Abassi in Lower Egypt.
"Mit Afifi in Lower Egypt.
"Jannovitch in Lower Egypt.

"The Mit Afifi, in acreage, and the total value of its product, far exceeds all the other varieties.

"At least 70 per cent. of the total Egyptian acreage in Cotton is of this variety.

"In 1006, 75·5 per cent. of the total crop was Mit Afifi, 15 per cent. Ashmouni, 5·5 per cent. Jannovitch, and 2·7 per cent. Abassi.

"As a rule 35 per cent. of the total crop is harvested at the first picking, 45 per cent. at the second, and 20 per cent. at the third, but these proportions vary considerably from year to year.

"The first picking is generally the best, and that from the third picking being the poorest samples.

"No. 1. NUBARI.—Named after Bojhos Pacha Nubar, is a fine long staple cotton, but of brownish colour. It is in many cases difficult to distiuguish from Afifi except by the feel and length of staple, the colour and appearance being very similar.

"The growth is being largely extended."

"No. 2. ABASSI.—Much resembles the American Sea Island varieties. Observe staple."

"No. 3. AFIFI.—Is the quality generally grown throughout the Delta upon which all transactions are based.

"It is brown colour, and as regards the length of staple and fineness of quality this varies much according to the districts in which it is grown.

"The value also varies according to the fineness of the quality, and there is a large difference in price between the fine grades and the lower qualities grown on poor lands."

"No. 4. TOKAR (SOUDAN) AFIFI.—This cotton was formerly merely locally consumed by the growers, but recent shipments have turned out so satisfactory, that this established growth is now recognised and the bulk of the crop is shipped to England and the Continent.

"This quality is grown from ordinary Afifi seed, and although not so perfect as the Delta growth, it possesses a fairly long and moderate staple."

"No. 5. JANNOVITCH.—This quality named after the originator, Mr. Jannovitch, who found this special growth, is of a creamy colour, silky touch, with a long fine and very strong staple, it is the most expensive Cotton grown in Egypt.

"Before concluding this report it is desired to record sincere acknowledgments for information and help very liberally given orally and otherwise, in some cases at no small sacrifice of time and trouble to Government officials, the Agricultural Department, and more particularly to Assistant Liwali, Ali Bin Salim.

"It is to their help and co-operation that much of the success of Cotton growing by the British East Africa Corporation in East Africa is due."

IMPROVING MADRAS COTTON.

(From the *Indian Agriculturist*, Vol. XXXIV., No. 7, July 1, 1909.)

The last number of the Memoirs of the Agricultural Department of India is of more than common interest to workers in South India. It raises the whole question as to the possibility of improving the cotton crop of this Presidency by the application of Mendelian principles in cross-breeding. Mr. P. F. Fyson, Professor of Botany, Presidency College, Madras, the writer of the paper, is optimistic, and, having convinced himself of fruitful results from work in this direction, he very rightly throws down the gauge and boldly states his views. It remains to be seen whether the local Department of Agriculture will accept his challenge. He has grown cotton plants in various places in and around Madras during the past four or five years, has crossed the flowers and observed the characters of the offspirng. His attention has been mainly concentrated on three characters, the shape of the leaf, the colour of the flower and the fuzz on the seed, selecting parents differing markedly in these respects. The first two of these he has demonstrated to be characters which behave according to Mendel's laws, but the third seems to be complicated by other factors, and does not yield to so simple a solution. Professor Fyson is to be congratulated on breaking ground on a crop so important to Indian agriculture, and the main feature of his work is that he has been able to study

the plants through a longer series of generations than has hitherto been done.

The shape of the leaf and the colour of the flower are easy to observe, and in the plants selected differ very markedly. The fineness and length of the lint is another character which Professor Fyson shows some reason for supposing to be capable of manipulating by crossing. But it is just here that the difficulties of the case commence. The experiments with hairs on the seeds were inconclusive and indicate that climate has to be considered; and this factor of environment, which is of no importance to the colour of the flower and the shape of the leaf, makes itself felt the moment we approach the really useful properties of field crops, early flowering, length of life, productiveness, soil requirements, resistance to drought, and so on. Furthermore, in place of dealing with plants with marked differences, we have, in examining the cotton crop of any tract, whether Northerns, Salems, Westerns or Coconadas, to deal with an immense entaglement of allied forms, very closely similar in visible characters but differing greatly in the value of their produce. The problem with Tinnies is simpler, and good work is being accomplished by Mr. H. C. Sampson, Deputy Director of Agriculture, at the Koilpatti Farm. In some respects the separate problems in the Madras cotton tracts appear to be even more arduous than that so skillfully attacked by Mr. Balls in Egypt, and the soil and climate of South India appear likely to prove very harassing impediments in any efforts to improve the staple. We do not, therefore, feel quite so optimistic as Professor Fyson when he says:—"The practical outcome of these observations appears to be that the cross-breeding of these varieties could be carried on with almost mathematical precision, and if, as seem likely, these principles apply to other characters, one might expect to obtain any desired type in a very few years." Most heartily do we wish that this may be so, and we trust that Professor Fyson may be able to continue the work he has commenced. The paper is full of interest, and the references show that the author has spent considerable time in reading up the voluminous literature on cotton varieties and the study of characters according to Mendel's laws. It is to be noted that the experiments were conducted under very considerable difficulties, and great credit is due to Professor Fyson for having persisted and carried through his work to a successful issue,

LANCASHIRE COTTON INDUSTRY.

(From the *Indian Trade Journal*, Vol. XIII., No. 158, April 8, 1909.)

UNPROFITABLE BUSINESS.

For more than a year the cotton industry has been depressed, says a writer in the *Times* Financial and Commercial Supplement, and there seems to be no prospect of an immediate revival in the demand for cotton piece goods and yarn. The production is large, larger than at any previous period in the history of spinning and weaving; for the extraordinary "boom" which began at the end of 1904 and lasted practically three years led to a great expansion of spindles and looms. Joint stock companies were formed to erect mills to the extent, in round figures, of 10,000,000 spindles, and a large proportion of these are now working and producing yarn. The increased output at first was absorbed by a heavy export demand, and by extensions in the weaving branch. There are, however, 4,000,000 spindles now in course of erection, and these are gradually bringing yarn upon the market. In 1903 we had in this country 44,000,000 spindles; to-day the figure may be put down at 54,000,000. The weaving looms extensions during the last few years amount to about 120,000 looms; in 1903, the total number was 647,000 looms, and to-day there are 760,000. This brief summary will give some idea of the expansion which has recently taken place in the Lancashire cotton trade.

CONDITIONS IN FOREIGN MARKETS.

Dealing now somewhat in detail with the conditions, it may be said that the larger production of piece goods and the consequent increased shipments have led to an accumulation of stocks overseas. The exports this year so far show a great falling off on the same period in 1908. The weaving trade just now is being carried on at a loss to the manufacturer, though he is able to secure yarn to make cloth at comparatively low rates. India, which takes on an average about 40 per cent. of our total exports of cotton cloth, is operating and placing orders for distant delivery very cautiously. Stocks in Bombay and Calcutta are not very heavy, but, in consequence of the great decline in values during the past 12 months, dealers there have, it is said, suffered financial loss, and this week Calcatta advices are of a rather disturbing character; until stocks get fully liquidated in our Dependency, it is hardly possible to expect much buying. China has been for some

time disturbed by fianancial affairs, and things are not much better to-day, failures having occurred in Shanghai which have adversely affected the market, and the decline and fluctuations in silver have been disturbing factors. Turkey, which is an important market for Lancashire, has been uncertain in her purchases; and in the Levant generally, owing to the unrest in Servia, trade has been poor. Egypt for some time has been affected by over-shipments and monetary troubles of some years' standing. Altogether, therefore, our various outlets have recently done badly for us, though the crops in most countries have not been unfavourable. It has been a question of a dislocation of credit and over-supply. Lancashire manufacturers are finding business very difficult to obtain at anything like paying prices, and it is feared that serious losses will be reported at the end of this month for the past quarter. There has been some discussion as to general short time in weaving, but concerted action is almost impossible, owing to the varied conditions of individual employers, though individual cases of short time are increasing in Blackburn, Preston, and Burnley. The home trade in cotton goods has been a little better during the past month. More contracts have been placed with makers, reports from the south rather than the north of Great Britain being of a more encouraging character.

EXPORTS OF YARN.

Spinners of yarn of American descriptions made big profits in 1905, and in 1907 the gain was the largest ever experienced in the history of the trade. The large shipments of yarn helped the market very much during those years.

Exports of yarn during the last six years were as follows:—

	lbs.
1903	150,000,000
1904	164,000,000
1905	205,000,000
1906	207,000,000
1907	241,000,000
1908	215,000,000

This year it seems as if exports of yarn will be of very small weight. Shipments to the Continent have been reduced considerably, and at the present moment spinners who usually send yarn to the Continent have very light contracts. The reduced imports of Germany have been very marked during the past several months, and this state of affairs has been felt severely by the spinning department. To-day the production is for the most part at full stretch, but the consumption is of a dragging character, and is not nearly equal to what is being put upon the market; the result is that the margin between the raw material and the finished yarn is so narrow that on every pound of yarn spun there is, without exaggeration, a loss of $\frac{1}{2}d.$ per lb. How long this will continue remains to be seen, but the Master Spinners' Federation will shortly hold a meeting and consider whether they should not arrange to work only four days a week. The losses declared this year so far are equal to 18 per cent. per annum on the share capital, and on share and loan capital combined, after allowing interest on loan, the loss works out at 10 per cent. per annum.

SUPPLIES OF RAW MATERIAL.

The raw cotton supply this season in American qualities is likely to be a large one. For the season ended last August the American crop was 11,582,000 bales; in the previous year the yield was 13,551,000 bales; and in 1905 there was an output of 13,557,000 bales. The estimate for the current season hovers about 13,600,000 bales, while some authorities pin their faith to a crop of nearly 14,000,000 bales. If the figures next August should prove to be even 13,500,000 bales, there will be plenty to go round for the requirements of the world. American cotton prices on spot in Liverpool vary a good deal from year to year. The lowest ever known was in 1898, when the average rate was $3\frac{5}{16}d.$; in 1904 it was $6{\cdot}60d.$; and in 1907, $6{\cdot}55d.$; last year the rate was $5{\cdot}72d.$; though the crop was less by 2,000,000 bales than in 1907. To-day there is an enormous stock of American cotton in Liverpool—namely, about 1,350,000 bales, against 1,150,000 bales a year ago. The supply of Egyptian cotton, it is feared, will be less this season than last year, and this is regarded as a blow to the fine-spinning trade in Lancashire, as the tendency is for us to produce much finer counts of yarn. It is certainly fortunate that in this year of depressed trade we shall have an ample supply of coton at low values. If we had had only a short crop in view, it is highly probable that trade would be in a much worse condition than it is to-day.

TEXTILE MACHINERY.

Our exports of textile machinery continue to be very large. In 1906 the value was £6,710,000, in the following year it was £8,039,000, and in 1908, £8,832,000. India is our largest customer, then come Germany and Japan. Our shipments in January of this year amounted to £732,000, as compared with £773,000 in

the same month of last year. India is continuing to take freely and so are Japan and Germany.

THE PROBLEM OF OVER-PRODUCTION.

In considering the outlook for the industry, the main factor is over-production. New spinning machinery is still starting in South Lancashire. Probably, unremunerative trade will stop the filling of factories with machinery to a certain extent. Then it is almost certain that short time will be forced upon the masters in one way or another. If, as is likely, short time is generally adopted, the lessened cotton consumption will tend to depress the raw material. Low values for cloth should attract buyers abroad, and this may lead to greater activity in the placing of orders for distant delivery, but a good deal depends on the clearing out of old stocks bought at higher rates than to-day's selling prices.

THE SUPPLY AND MANUFACTURE OF WOOD PULP.

(From the *Indian Trade Journal*, Vol. XIII. No. 157, April, 1, 1909.)

An Engineering correspondent writes as follows to the *Times* Engineering Supplement of March 10th :—

The continually increasing demand for cheap paper-making materials during the last twenty years has resulted in a most remarkable expansion of the wood pulp industry. The general adoption of this material as a substitute for rags and Esparto grass in the manufacture of the cheaper classes of papers is very clearly shown by the Board of Trade returns, which furnish an accurate index of the growth of the trade.

In 1887, the imports of wood pulp into this country were for the first time separately classified, and in that year they amounted to 79,543 tons, valued at £511,450. In 1905 these figures had risen to 578,012 tons and £2,759,627 respectively ; while during 1908 the shipments were no less than 748,419 tons, with a value of £3,625,803, or a total increase in tonnage during the period under review of nearly tenfold. The rapidity with which the Scandinavian pulp-makers have increased the capacity of their mills, in order to meet the demand, has, of course, had the effect of keeping down prices somewhat, but it will be seen from the above figures that the total value of the imports into this country during last year was about seven times that of the shipments for 1887.

The best qualities of cellulose for paper-making are still obtained from rags and Esparto grass, and it is worthy of note, as an additional indication of the development of the British paper trade, that although the consumption of wood pulp as a raw material, or, rather, as a "half-struff," has increased in such a remarkable degree, the consumption of rags and Esparto has not appreciably decreased, although the market value has inevitably fallen, as the result of competition with the cheaper substitutes.

The various qualities of wood pulp which are now available for paper-making purposes are divided into two distinct classes, "mechanical" pulp and "chemical" pulp. In the production of mechanical pulp no chemical treatment is involved ; the operations, as will be indicated presently, are entirely of a mechanical nature, and hence the name under which the material is dealt with in commerce. On the other hand, "chemical pulp" is a very much purer form of cellulose, obtained by the treatment of the wood with various chemicals, this latter fact accounting for its technical description.

MECHANICAL PULP.

In the manufacture of this material, of which 432,478 tons were imported into this country during 1908, the process is very simple. Large blocks of wood are fed into the grinders which consist merely of revolving grindstones, with feeding arrangements, which press the blocks against the face of the stone, the fibres being thus torn from the blocks. As the wood is ground off, it is washed away by flowing water, passed through screens, formed into thick sheets from which a part of the water is extracted by pressing, packed into bales, and shipped as "mechanical pulp." The grinding action to which the wood is subjected destroys the "felting power" of the fibres, and in consequence machanical wood pulp is not used without admixture with other superior forms of celluolse in the manufacture of paper. For making what are known as paper boards it can be used without any addition, but if mixed with a very small proportion of "chemical pulp," which is longer in fibre, it forms the material from which almost all "news" and other inferior printing papers are produced. The "felting power" of mechanical pulp is improved if the wood is steamed for about ten hours before grinding, but even the best qualities of the "hot-ground" product

are unsuitable for the manufacture of any but the lowest classes of printing paper.

Mechanical pulp is placed on the market in two forms; as "wet mechanical" and "dry mechanical." The bulk of the mechanical pulp imported into this country is shipped in the wet condition; of this quality the imports in 1908 were 422,957 tons. In the same period, only 51,757 tons of the dry pulp were returned. During recent years very large shipments of mechanical pulp have been received from Canada, which is now an important source of supply.

CHEMICAL PULP.

The manufacture of chemical pulp is a much more complicated operation. The wood which forms the raw material consists of about two-thirds pure cellulose, with one-third non-cellulose compounds. By removing the latter bodies, a practically pure collulose fibre is obtained, inferior only to that derived from rags and Esparto grass. To attain this object, various processes of chemical treatment are in use, and the particular reagent used gives its name to the resultant product; hence we have in commerce soda pulp, sulphate pulp, and sulphite pulp. In each of these processes the wood undergoes the same preliminary treatment. The trees are sawn into small logs, and the bark is removed. The logs are then passed through a sloting machine, which turns them into small boards; the knots are bored out, and the boards are passed through a breaker, which resolves them into chips, after which the chips are screened to remove the dirt and dust.

The soda process consists in digesting the chips for about twelve hours, with a strong solution of caustic soda. The high temperature and pressure involved in this process affect the cellulose injuriously, the yield and quality of the fibre being inferior to those obtained in the sulphite process. In the sulphate process, the digesting solution is a mixture of sodium sulphate, sodium sulphide, and caustic soda. The pulp produced although uniform in strength is also inferior to that obtained from the sulphite process; it contains more of the outer substance of the wood, and consequently is darker in colour, and must be employed for the production of inferior goods. It finds an outlet in the manufacture of wrapping papers, and for the production of these it is well suited. Sulphate pulp is largely used by Scandinavian paper-makers, whose "Kraft" wrapping papers have a high reputation in the trade. The sulphate process is extensively adopted in the United States for the production of pulp from poplar wood, and sulphate pulp is also employed by British paper-makers for maxing with Esparto grass, which latter material it is now supplanting to some extent. Its use as a substitute for Esparto, however, calls for special care in the washing operation.

The disadvantages of the two preceding methods of treatment are overcome in the sulphite process for the manufacture of chemical pulp. In this case a solution of a bisulphite of lime or magnesia is employed in the digesting operation. The Eckman process consists in digesting the wood in a lead-lined revolving digester. In preparing the solution, sulphurous acid gas is passed through a tower containing the magnesia, the sulphurous acid and magnesia being kept in the necessary proportions to form a double sulphite, the resulting solution containing about 1½ per cent. of magnesia and 4½ per cent. of sulphurous acid. The digesting process occupies about 11 hours, and the pressure employed is about 90 lb. to the square inch. In the Partington process, the sulphurous acid gas is absorbed in milk of lime, and the bisulphite solution is at once obtained; in this process the wood is digested for about 18 hours. In the Mitscherlich process a weaker solution is employed, with a lower pressure, and the boiling is continued for a much longer period, a higher percentage yield of pulp being obtained.

In 1908, 315,941 tons of chemical pulp were imported; of this amount 288,655 tons were shipped in the "dry" condition, that is, containing 90 per cent. of absolutely dry pulp and 10 per cent. of moisture. Of "wet" chemical pulp, only 27,286 tons were taken by British paper-makers. The Scandinavian mills supply about one-half of the output of chemical pulp.

In view of the fact that wood pulp is brought into the market in what is known as the "wet" condition, the exact amount of moisture which it should contain has been the subject of much controversy. In order to preserve the nature of the fibre, it is essential that chemical pulp shall not be completely dried; while in the case of mechanical pulp, the cost of drying would be greater than the additional cost of carriage involved by shipping it in the wet condition. Accordingly, certain percentages of moisture are recognized in the trade, and the pulp is brought on this basis. In practice, however, it very frequently happens that the specified limits are considerably exceeded, and therefore a careful system

of testing after its arrival in the paper mill is necessary. It will readily be understood that the presence of 2 or 3 per cent. of excess moisture constitutes a serious ground for complaint, as this means that the consumer would be paying for water at the same rate as for a costly raw material.

During the last ten years repeated efforts have been made by the Paper Makers' Association of Great Britain, by the British Wood Pulp Association, and by the Scandinavian pulp manufacturers' associations to put the sampling and testing of wood pulp on a scientific basis, but the task has proved to be an extremely difficult one. The variable nature of the material and the influence of atmospheric conditions during transit and storage render the task of sampling and testing the pulp supplies a somewhat delicate process, which can only be satisfactorily undertaken by chemists possessing an intimate knowledge of this branch of analytical work. Elaborate rules for the guidance of those concerned have been formulated by the associations mentioned above, and in conclusion it may be observed that the necessity for establishing exact control over his raw materials has in some measure convinced the British paper-maker of the advantages to be derived from the application of exact chemical science to the operations of an important industry.

A FIBRE PLANT.

(From the *Agricultural Gazette of New South Wales*, Vol. XX., Part 9, September, 1909.)

The fibre plant, Uganda hemp (*Asclepias semilunata*), has been tested at the Experiment Farms.

At the Hawkesbury Agricultural College Farm, seed was sown 28th September, 1908, and germinated extremely well. The plants proved to be very drought-resistant, and during the dry summer experienced a growth of 5 feet was attained.

Where the plants grew thickly, the growth was tall and straight, with scarcely any branches; but where the plants stood far apart, a large number of branches were formed.

Seed pods formed in February, and ripe seed was available in April.

At Wollongbar Experiment Farm the crop was irregular, and the growth was only 3 to 4 feet at the end of six months.

At Grafton Experiment Farm, the plants from seed, sown broadcast, 7th September, 1908, grew very slowly, and by 2nd March, 1909, when seed was available, had reached a height of barely 4 feet.

The Manager of the farm says that in comparison with other fibre plants, such as Ramie, this hemp does not compare favourably, and he is of opinion that it is not of much commercial value.

At Moree Farm, the Manager formed the opinion that irrigation was essential for a profitable crop. Without irrigation the plants attained a height of from 2 to 3 feet only; but where irrigated they made a growth 5 feet 4 inches in six months. From its free seeding habits it might become a pest in loamy soils in moist climates.

At the Wagga Experiment Farm the hemp made fairly good growth. Mr. McKeown considers that this plant is very similar to that which, in the neighbourhood of Sydney, we used to know as Wild Cotton.

PREPARATION OF FIBRE.

Concerning the preparation of the fibre of Uganda hemp, Mr. R. G. May, Acting-Experimentalist, Hawkesbury Agricultural College, reports:—The stems were dried for ten days, this long period being necessary owing to the prevalence of damp weather and fogs. When dry, the stems were retted for eight days, when they were again well dried. Difficulty was experienced in removing the bark from the wood, both adhering closely one to the other. The bark was ultimately removed by being stripped off with a knife—a slow, laborious, and uncommercial method.

In separating the fibre from the vegetable matter difficulty was again experienced. The approved method of pounding the bark was unworkable, a sample of the product of such a method being seen in sample No. 2. Resort was made to pulling out single fibres and stripping off any vegetable matter that adhered to them, so as to secure a general sample of the fibre as should be obtained if it lent itself to approved commercial methods; such as is to be seen in sample No. 1. The fibre is glossy, and will probably lend itself readily to dyeing processes. It is tender and will not stand much tension. Twisted into a thread, it breaks easily and does not compare with cotton for strength. An attempt was made to secure a sample by treating the fibre with acid and caustic solutions. The process seems to have rendered it much weaker, though it produces material that would probably pass through the commercial opeartions necessary in manufacture.

DRUGS.

WORK AT THE IMPERIAL INSTITUTE.

(From the *Chemist and Druggist*, No. 1,542, Vol. LXXV., August 14, 1909.)

The annual report of the Imperial Institute for 1908, which has just been issued, contains brief allusions to some of the more important work which has been undertaken by the Scientific and Technical Department during the year. No fewer than 375 investigations and inquiries were requested by the Colonies and India, the number of the reports furnished being 393, while 141 investigations were in progress at the close of the year. Cotton, tobacco, minerals, and rubber were the chief articles investigated. In view of the great European demand for West African palm oil, an investigation has commenced at the Imperial Institute in co-operation with the Agricultural Departments of the Colonies, with a view to finding a suitable method for the better preparation of the oil from the fruits, the natives who manufacture palm oil still employing primitive and wasteful methods. In recent years there has been an increased demand for vegetable oils and fats suitable for the manufacture of butter-substitutes, and this has led the Institute to investigate a large number of new and little-known oil-seeds, which were afterwards submitted to technical trials by manufacturers. An investigation is also being conducted for the Indian Government in connection with the utilization of cotton seed oil for similar purposes. The economic resources of the Seychelles have continued to receive considerable attention, especially in connection with vanilla, essential oils, and tanning-materials, a summary of which has been given from time to time in these columns. Much work has been accomplished in minerals, including an examination of Ceylon "concentrates" containing thorianite and monazite; while from Newfoundland certain kinds of help were found to be unusally rich in potassium salts and iodine. Further consignments have been asked for, with a view to ascertaining its commercial possibilities. In Drug department sixteen samples were received and investigated, but none appeared to be of important commercial interest. Two samples of "Muziga" from the East Africa Protectorate, identified at Kew as the product of *Warburgia ugandesis* were received, and found to contain manitol (about 8 per cent.) tannin and a pungent resin soluble in ether. From Sierra Leone *Ageratum conizoides* ("Craw-craw") was examined and found to contain a minute quantity of a crystalline alkaloid, to which the physiological activity of the drug is thought to be due. Samples of the stem, leaves, and decoction of the "Kiki" plants from the Straits Settlements, which has been recommended as an anti-opium remedy, were examined, but nothing was detected which was likely to be physiologically active. During the year considerable progress was made with the investigation of Indian species of *Aconitum*, *Hyoscyamus*, *Datura*, and *Strychnos*, but these inquiries are not yet completed, and among other drugs and poisonous plants under investigation are included Tonga bark and root from Fiji, wild kola from Southern Nigeria, and various native drugs from the West African Colonies. Among the resins examined were several samples of copol, elimi, dammar, and colophony, numbering sixteen altogether. A copal from a new district in the Gold Coast proved to be of very good quality, and, after cleaning and grading, was valued at 70s. per cwt. Samples of elmilike resins received from Nigeria and Uganda proved to be similar to Manila in composition, but were not so clean or well-prepared. India and Fiji dammar was tried by a firm of crêpe manufacturers as a substitute for shellac, but proved unsuitable. In addition to the foregoing, thirteen samples of "gums" were received, but of those obtained from British Colonies only one from Northern Nigeria and two from the Gold Coast were of a saleable type. The Nigerian gum was from *Acacia Caffra* and was very similar to Senegal gum. Investigations in regard to spices mainly related to vanilla, cinnamon-bark, and ginger. In regard to cinnamon investigations show that although the bark is roughly prepared and only suitable for manufacturing purposes, it gives a fairly satisfactory yield of cinnamon oil of good quality, and suggestions for the better preparation of the bark have been made. It may be recollected that a small parcel of Seychelles cinnamon oil was offered at the London drug-auction some months ago, when 1s. 6d. per oz. was wanted for it. During the year assistance has been continuously afforded to producers of Sierra Leone ginger in valuing and disposing of their produce in London. It is interesting to note that a very complete series of "grass oils" has

Photo by H. F. Macmillan.

NEPHELIUM LITCHI.

"LITCHI" OR "LICHEE."

been received from Ceylon and is at present under investigation, and among the samples of lemon grass oil were some from Uganda and Bermuda, the citral-content of which was extremely low and the oil almost useless for commercial purposes. Origanum oil (containing 80 per cent. carvacrol) is being sold on the London market by the Cyprus Government, and it has been ascertained that better prices would be obtained if it were rectified so as to remain colourless. For this purpose a modern rectifying-still is being specially constructed in London for shipment to Cyprus. Pure carvacrol is also likely to be manufactured on a commercial scale by the Cyprus Government, they having already sold a small trial consignment to a London house. Other essential oils under investigation include Cyprus laurel oil of excellent quality and Fijian bay oil. The foregoing investigations may be said to represent some of the least important work of the Imperial Institute, that devoted to staples like cotton, rubber and tobacco being of much greater value and importance.

EDIBLE PRODUCTS.

THE LITCHI, OR LITCHEE FRUIT.

By H. F. Macmillan.

(*Illustrated.*)

Nephelium Litchi (N. O. Sapotaceæ),—"Litchi," or "Litchee."—A small bushy tree with handsome dense foliage, native of China. It blossoms in the dry season (about February), producing sprays of pale-green flowers, and ripens its fruit about June. The fruit is of the size and form of a large plum, with a rough, thin, scale-like rind, which becomes of a beautiful red-tinge, gradually turning to a dark brown colour before it is quite ripe. The jelly-like pulp or aril which covers the seed is of a translucent whiteness, and of an agreeable refreshing flavour. This fruit, represented by different varieties of varying quality, is grown to great perfection about Calcutta and elsewhere in India, and is commonly sold in the bazaars when in season. Cameron says it thrives up to 3,500 feet in South India, giving at Bangalore two crops of fruit a year (in May and December). It is grown successfully in Mauritius, but, curiously enough, it is scarcely ever met with in Ceylon. The tree flourishes and produces fruit at Peradeniya, but the variety here grown is obviously an indifferent one. There are several varieties in cultivation, distinguished by size and shape of fruit, quality of pulp, and size of seed. Litchi fruit are dried in China and Cochin China, from whence they are exported to England and the United States. Dried litchis are not unlike raisins, both in appearance and taste. The tree may be increased by seed, but budding or grafting should be adopted to propagate the best varieties.

TEA INDUSTRY OF EASTERN BENGAL AND ASSAM.

(From the *Indian Trade Journal*, Vol. XIV. No. 179, September 2, 1909,)

Number of Estates.

A Report on Tea Culture in Eastern Bengal and Assam for the year 1908, compiled by Mr. Strong, Officiating Director of Agriculture, Eastern Bengal and Assam, is published in the supplement of the *Government Gazette* of that Province dated August 18th. Mr. Strong states that there were 927 tea gardens in Eastern Bengal and Assam in the province at the close of 1907. During last year six new gardens were opened, two in the Jalpaiguri subdivision, one in Alipur Duars, one in Karimganj subdivision of Sylhet, and two in Dibrugarh subdivision of Lakhimpur district. There was also a reduction of two gardens, of which one was in the Sadar and the other in the Jorhat subdivision of the Sibsagar district. The latter was amalgamated with another garden. The number of tea estates at the close of 1908 was thus 931. An area of 9,212 acres of new extension was added to the area under tea at the end of 1907, and an area of 3,971 acres of old tea was abandoned during the year. Of the 433,290 acres of tea remaining, 409,879 acres or 94 per cent. was actually plucked. The largest amount of new planting was done in the Jalpaiguri district, and the largest area of old tea abandoned was in Cachar. There was a slight increase of 79 acres on the area plucked during the year, as compared with 1907. The total area under tea also shows an increase of 1 per cent. in comparison with the figures of the previous year.

The total area of land comprised within tea estates increased during the year by 3·6 per cent. from 1,357,269 to 1,406,607 acres, of which 38 per cent. is actually under tea.

LABOUR EMPLOYED.

Owing to a successful recruiting season, there has been an increase of 5 per cent. in the number of labourers employed during the year, against a falling off as noticed in the report for 1907. The number of permanent labourers rose in all parts of the province, expect Kamrup. Although temporary labourers indicate a decline for most tea districts, the total for the province shows an increase. Two causes operated to bring in this altered condition, *viz.* (1) the orders issued by the Government of India in February, 1908, on the recommendations of the Committee, which was appointed in 1906 to enquire into certain matters connected with the supply of labour for the tea gardens of Assam. It was urged by the Committee that greater freedom should be given to the labourers, and that the conditions of tea garden life should be rendered more attractive. (2) The second cause was the existence of famine or scarcity in some of the recruiting areas, specially in the United Provinces, as noticed in the previous year's report.

The proportion of temporary to permanent labourers varied considerably, as in past years. In the Surma Valley temporary labourers formed only 6 per cent. of total force, in the Assam Valley 7 per cent., in Chittagong 18 per cent., and in Jalpaiguri 25 per cent.

SCIENTIFIC ENQUIRY.

The usual Government grant of Rs. 10,000 was made to the Scientific Department of the Tea Association during the year under review. The Association is doing valuable work by its efforts to add to our knowledge of the constitution of tea soils, the best manurial treatment for tea and the preventive and remedial measures which can most usefully be employed against the more common insect pests and blights, to which the tea plant is subject. Two useful pamphlets published during the year were "Mosquito Blight of Tea" by Mr. C. B. Antram, F.E.S., and "Heeleaka Experimental Station" by Mr. C. M. Hutchinson, B.A. Mr. Macrae from Pusa made enquiries into disease at Darjeeling, the results of which are not yet available.

The weather was generally dry during the early months, which resulted in a late start of the tea season, which also closed early in some tea districts. The rainfall in all tea districts, except Dibrugarh, was below the average of the previous five years. On the whole the season was not very favourable for the growth of tea. Some gardens in Jalpaiguri district suffered severely from hailstorms. Red spider prevailed in some gardens in Lakhimpur, and greenfly also injuriously affected the outturn of the district. In Cachar the effects of the drought in the earlier part of the season were a late start of the season, a deficient yield, and an unusual variety of tea-blights of exceptional severity. On the rainfall assuming normal conditions, the garden flushed freely in the middle of the plucking season, and, but for an attack of mosquito-blight of severe nature, the outturn would have equalled that of 1907.

OUTTURN.

The year's crop amounted to 210,472,150 lbs. of black and 1,075,340 lbs. of green tea, as against 209,370,934 and 1,536,507 lbs. repectively, of 1907. The combined total of 1908 comes to 211,547,490 lbs., showing an increase of 640,049 lbs., or ·3 per cent. over that of 1907.

The season was not very favourable for tea, and the outturn in most districts fell off. The increase in the total output must, therefore, be attributed partly to the increase in the area under the crop, and partly to the larger labour force employed during the year under report. The general quality of the crop must be characterised as somewhat disappointing, and although ideas are usually at variance on a question of this nature, there can be little doubt that the past season's manufacture has been below the general standard of recent years. Cachar and Syhlet were, perhaps, more unfortunate than other districts in this respect, and the result was largely reflected in the produce of these centres; coarse and stalky teas were more in evidence than formerly, and this was not compensated for by any increase in yield.

The tea produced by the Assam gardens in the first part of the season was also below the average, and subsequent improvement following the rainfall hardly produced a compensating recovery.

TEA-SEED.

Under orders of the Government of India, tea-seed does not separately appear among the articles of trade to be shown in the trade returns. Hence accurate information about imports and exports of this commodity is not available. Only 354 maunds of the seed has

been shown as exported from the Upper Assam block to Chittagong Port during the year under review.

PRICES.

The average prices of tea obtained in Calcutta and London, and the statistics of production, as furnished by the Secretary to the India Tea Association for the year under report, compared with the figures of the previous year, are given in the following statement :—

YEAR.	Brahmaputra Valley.		Surma Valley.	
	Number of packages.	Price per lb.	Number of packages.	Price per lb.
1	2	3	4	5
	LONDON SALES.			
From 1st April, 1907, to 31st March, 1908 ...	698,601	8·79*d.*	271,360	23*d.*
From 1st April, 1908, to 31st March, 1909 ...	720,692	8·83*d.*	275,971	6·2*d.*
	CALCUTTA SALES.			
From 1st April, 1907, to 31st March, 1908 ..	181,464	7*a.* 6*p.*	273,196	6*a.* 3*p.*
From 1st April, 1908, to 31st March, 1909 ..	184,161	6*a.* 7½*p.*	254,095	4*a.* 11*p.*

YEAR.	Jalpaiguri.		Chittagong.	
	Number of packages.	Price per lb.	Number of packages.	Price per lb.
6	7	8	9	
	LONDON SALES.			
From 1st April, 1907, to 31st March, 1908 ..	201,094	7·49*d.*	6,057	7·26*d.*
From 1st April, 1908, to 31st March, 1909 ..	181,902	6·91*d.*	5,549	6·05*d.*
	CALCUTTA SALES.			
From 1st April, 1907, to 31st March, 1908 ...	180,795	6*a.* 10*p.*	8,787	6*a.* 3*p.*
From 1st April, 1908, to 31st March, 1909 ..	185,766	6*a.* 0*p.*	7,878	4*a.* 11*p.*

It is understood that the figures in the above statement relate to teas manufactured in calender years, as practically no tea is manufactured between the 1st January and the 31st March in any year, the amount manufactured during that period being in any case so small that it may be neglected.

Except for London sales of the Brahamaputra Valley teas, which fetched ·04d. more per lb., the prices of tea grown in all parts of the province fell off both in London and Calcutta in comparison with the previous year. The decline in values was no doubt dueto shrinkage in demand for low grade teas, the price of which was considerably forced up during the closing months of 1907 and at the beginning of 1908, owing to exceptional demand from all markets of the world.

CONDITION OF INDUSTRY.

The beneficial results of the increased labour force are apparent this year. Despite a season which was far from favourable in the beginning, and the increased expenditure involved by recruiting, there has been a substantial increase in acreage under the crop, and in the number of new gardens opened.

Prices at the close of the year compare favourably with last year's, although the quality of leaf generally was rather inferior. But over the whole year the prices are reported to have declined. The cause is no doubt partly shrinkage in demand for lower grades, but also is partly due to depreciation in quality, especially for the Assam districts due to unfavourable conditions. These are temporary, while it is hoped that the improvement in labour conditions is permanent, and future prospects are certainly brighter for the tea industry.

RICE GROWING.

(From the *Queensland Agricultural Journal*, Vol. XXIII., Pt. 3, September, 1909.)

We have lately had several inquiries from farmers concerning the possibilities of rice-growing in Queensland. Most of our correspondents are possessed with the idea that rice can only be grown in tropical swamps, under conditions which could not lead to the establishment of the production of this cereal in a community of European farmers. This is a too common error. Many portions of this State are eminently adapted to rice culture, and very paying returns have been received, especially in the Southern coast districts, by those who have cultivated what is generally known as mountain rice. The swamp rice of Japan, Java, and other tropical countries has never been attempted in Queensland, and would, certainly, prove a disastrous speculation to any one who tried it. The following exhaustive article on the cultivation of this cereal was written in 1901, by Mr. F. W. Peek, of Loganholme, at a time when rice was largely grown at Pimpama, at Cairns, and in some other localities. There is no more trouble in growing rice than in growing wheat. Swamps and irrigation canals are not needed. The land can be ploughed and prepared as for wheat, and the crop harvested in the same manner. We reprint Mr. Peek's paper,

in the hope that rice-growing may once more figure in the settled industries of the State:—

RICE-GROWING IN THE LOGAN DISTRICT, AND ITS PREPARATION FOR MARKET.

BY FRED. WM. PEEK, Loganholme.

INTRODUCTION AND EARLY CULTIVATION.

In writing up this article (by special request), I will endeavour to make the information contained as intelligible as possible to the ordinary farmer and agriculturist. Of the value of rice there can be no two expressions of opinion, as this cereal forms the chief food supply of over one-half of the entire human race, and certainly there is not another product or cereal that, commercially or economically, obtains the same value as rice.

The varieties of rice to be obtained from the various countries where rice forms one of the staple crops for food supply, are innumerable, running into several hundred varieties, particularly where it is grown largely, as in India, China, Japan, Siam, West Indies, and in other parts of the world, and it has been found that local names have been given to rice of the same variety and quality. For general purposes and distinction, rice has been classified into three distinct varieties or classes. These are known to us as the "Aus," or upland rice; the "Aman," or swamp rice; and the "Boro," another swamp rice, or a variety requiring inundation, warm climate, and rapid growth, and producing a large coarse grain, but which, so far as I have been able to ascertain, has not been tried or cultivated in Queensland up to the present. The portion of the Logan district where rice is now being extensively cutivated is known as Pimpama Island, which is situated in the south-eastern portion of the State, in 153 degrees east longitude and between 27 and 28 degrees south latitude, and is approached from Brisbane by means of the South Coast Railway as far as Beenleigh, thence by well-formed roads for a distance of twelve miles crossing the Albert River and skirting round the base of Mount Stapylton or what is known locally as Yellowwood Mountain, which presents to the visitor's gaze one of the prettiest views in the Logan district, dotted from base to summit with its settlers' homes and splendidly laid out farms. The dark-green patches of sugar-cane, bananas, maize, and other crops, strongly contrasting with the rich red volcanic soil visible here and there, make a picture of agricultural industry both pleasing and effective, and one of which the district is justly proud.

What is known as "Pimpama Island" is the land lying between the Logan, Albert, and Pimpama Rivers, which are connected by a series of creeks and swamps with a long frontage to the Pacific Ocean or Moreton Bay, containing several thousand acres of rich coastal land, interspersed with large areas of ti-tree swamps, the water of which is brackish and undrinkable. The soil cultivated, and which has proved itself best adapted to the growth of rice, is of a sandy, loamy nature in appearance, but containing in a remarkable degree the constituents most suited to the nature and requirements of the plant, being easy of working, although slightly tenacious in wet or showery weather, but of very shallow depth in some places. Layers of decomposed marine shells are found in rather large quantities, pointing out that the lands were once ocean-washed, and the receding water have left valuable deposits of lime and other constituents in the soil, which, together with the rich humus formed by the decaying foliage of scrub vines, palms, ferns, &c., of rank tropical growth, have left these patches of soil of varying area between the swamps most suitable for rice culture.

The value of the land averages from £2 10s. to £6 per acre without improvement, and very little, if any, remains unalienated, it being so close to Brisbane, and the Logan district being one of the first settled districts of the colony. All the best lands were early availed of for cultivation. Who first introduced the rice seed of commercial value to Queensland appears to be undecided; but our State Botanist, Mr. F. M. Bailey, has described a species of wild rice (*Oryza sativa*), a native plant of North Queensland, growing in the swampy lands there, as being indigenous to this State; also, the Chinese have grown rice rather extensively on the North Queensland river banks, particularly near Cairns, in patches for many years past, and which has met with a ready sale when placed on the market.

But it is to Mr. A. J. Boyd, the present editor of the "Queensland Agricultural Journal," that the credit is due of the introduction, in 1869, of rice-growing in the Logan district—he having procured the seed and planted it as an experimental crop at his sugar plantation, Ormeau, which he then had at Pimpama. The seed was one of the Japan varieties, with which he met fair success as regards the growth and result. Since

that time, from the seed Mr. Boyd raised and distributed, other settlers have taken up the matter of rice-growing at various times and in a fitful manner, the largest local planter some fifteen years ago being Claus Lahrs, an enterprising German settler, who planted at Pimpama Island two or three varieties of the China and Japan rices, but, owing to the seed not being tested or acclimatised, he met with but indifferent success. He even went so far as to incur the expense of erecting a mill for dressing the paddy (as rice in husk is termed), but after a few years he gave it up, partly because of the machinery, not being of the best description for dressing the rice, doing its work imperfectly, but also because the rice grown was not the best variety for table use or suitable for the home market. So the industry, so far as the manufacture was concerned, was allowed to lapse. The farmers since then have still kept on planting the rice, which they have cut and used for fodder for their horses and stock, using the seed saved from the crop reaped for re-sowing the land. The consequence has naturally been that the crop had deteriorated with successive plantings, through the same seed being used without change. But three things of great importance had been learned. These were: 1st. The suitability of the soil and climate of the Logan district for rice culture. 2nd. The proper time at which to sow the seed to ensure success. 3rd. The best system of planting and after-treatment of the crop. The value of rice has also been thoroughly tested as green feed for horses and stock, who eat it greedily and keep in splendid condition when fed upon it. The greatest difficulty in rice culture has been found in procuring the right seed, there being such a large variety of each kind, both with their distinctive flavour, colour, and quality, as well as in the facility with which the crop can be handled and harvested (as I will explain further on) and in the requirements of the merchant, who has his prejudices in favour of certain kinds, which more or less best suit the tastes of the consumer. This has now to a certain extent been overcome, and our farmers are now prepared to carry out this important branch of agricultural industry on sound business lines and with up-to-date methods.

PREPARING THE LAND.

Rice, like every other cereal and vegetable, to ensure good results, must have a certain amount of attention and care in preparing the land, although the question of drainage does not enter so largely into consideration as regards rice as with other cereals, and it, of course, greatly depends as to which variety of rice you intend to cultivate, but stagnant water should be avoided as detrimental. The variety I intend this article to illustrate is the Aus, or upland rice. I have tried the Aman variety as an experiment, but with small success, the chief fault of the latter being the necessity of it being submerged continuously with not less than 2 to 3 inches of water, and, when the crop ripens, the difficulty of harvesting, owing to the grain being so brittle that at the least touch it leaves the ear with a consequent loss of seed. The variety of rice now grown most extensively in the Logan district is known as the "White Java," which gives a length of straw from 4 to 6 ft., with a good flag, besides a grain of good length, fairly plump, and good cropper, and, so far, seems fairly free from disease or rust. Other varieties now being tried are the China, Kobe Japan, Batavia River, and Italian Upland, of which the White Java and the Italian Upland have been obtained through the medium of the Agricultural Department.

In preparing the land for planting, ordinary methods need only be adopted—that is, to first plough, leaving the soil to lay for a week or so, to aerate and sweeten; then crossplough and harrow, bringing the soil to as fine a tilth as possible. The best time in this district for planting (and I should think it a suitable time for all districts south of Rockhampton) is at the end of September or at the beginning of October, when we get the first rains. In cultivating for rice on hillsides or sloping land with a natural rapid drainage, it would be advantageous to slightly terrace the land crossways to the fall of the hill, leaving an open catchment drain on the higher side, blocked at each end to conserve the rain water, because even so-called upland rice must have a certain amount of moisture, and by the construction of the above drain, or dam so to speak, the gradual percolation of the conserved water will have the desired effect of helping to supply the necessary moisture, which would be about 20 to 30 in. of rainfall spread over the period of growth. This rainfall has produced very good crops of fair yielding grain.

SOWING THE SEED.

In sowing the seed we have to be determined as to our requirements—if for cropping for grain or for fodder purposes only. There are three systems: Broadcast chiefly for fodder purposes, planting in drills, and transplanting from nursery beds. In the first instance

—*i.e.*, sowing broadcast—it will take a bushel (60 lb. of paddy) to the acre, the seed being harrowed and treated in the same manner as oats or wheat in the after cultivation. But the plan most generally adopted, and by far the best, is planting the rice in drills 2 ft. 6 in. or 3 ft. apart, and about 10 to 12 in. between the plants, which may be done successfully with an automatic seeder. By this method, about 35 to 40 lb. seed to the acre are required. It ensures the crop being more even and not so patchy as when sown broadcast, and allows a better chance of going through the crop with hoe or cultivator to remove any weeds that may have made their appearance before the rice has got fairly started. The system of planting in nursery beds and transplanting out is adopted chiefly in planting swamp rice or the Aman variety; but, as this system of planting entails a lot of labour, I do not think it will ever come into active operation in this State. The mode of operations with this variety is briefly as follows:—Beds are prepared according to the area to be planted; a bed about 20 ft. long and 6 ft. wide will be amply large enough to grow plants for a quarter of an acre, the beds being well made and enriched, so as to produce vigorous plants. Sow the seed and rake in carefully, watering at certain intervals. Care must be taken to keep the plants growing. When the plants are about 6 in. high they are ready for transplanting to their permanent beds, which is done by making holes about 10 in. to 1 ft. apart in the rows and 2 ft. 6 in between the rows. But, as before pointed out, this is a most tedious and costly mode of planting, and the labour involved is a serious item for consideration. You might as well try to transplant a field of oats or wheat, and expect to get a profit. So that it will be easily seen the planting in drills is at once the most economical and systematic, besides being the one most generally adopted.

HARVESTING THE CROP.

This was a difficult matter to undertake with the rice formerly planted in the Logan district, the China and some of the Japan varieties being so brittle that when ripe the least touch caused the grains to drop off with a consequent loss of seed. This has been happily overcome to a certain extent by the better variety planted. Not only does the White Java give better facility for harvesting, but the straw is of a better colour and quality, of a good length, averaging from 4 ft. to 5 ft., and in good land even 6 ft. is no unusual length; and no more fairer or gratifying sight to the farmer's eyes can be imagined than the rich appearance of a rice field ready for harvesting: this is whilst the stalks have still a bronze-green appearance, the heads have turned a golden brown, about half-way down, and appear what a wheat farmer or an inexperienced person would deem three-parts ripe. The heads of rice, heavy with grain, have a graceful, drooping appearance; as many as thirty to forty heads have been produced from a single grain planted—the product weighing from 10 oz. to 14 oz. By cutting some varieties of rice in this state, the loss is not so great as with over-ripe grain. The cutting is begun in the morning as soon as the dew is off, the rice being bound up into very small bundles, ready to be threshed as soon as possible (which will be explained later on). Rice is never left stocked in the field, but is treated as quickly as possible.

The usual method pursued in harvesting is to cut with the ordinary sickle or reaping-hook, although where large areas are now being planted it is thought that the latest inventions of wheat-harvesting machinery could be used most effectively. A slight alteration in the reaper and binder might be required in the way of lighter and broader wheels on the rich soft rice lands, but otherwise I see no difficulty in the harvesting. At all events, it is the intention of the writer to induce some firm to make a trial at next harvesting as an experiment, and if successful a machine will doubtless be obtained on co-operative lines for the use of the district. After cutting with the sickle, the rice is gathered into bundles and carted into the barn or shed, or, if not sufficiently dry, is left for a day or so to ripen; but this is not often the case, experience having taught our farmers the right time to cut, and it is generally taken to the barn at once for stripping or threshing.

THRESHING THE RICE.

Where there are large quantities, this can be done with the ordinary flail on a threshing-floor, but other systems are in vogue where only small quantities are grown. One plan of threshing is by driving four forks into the ground, about 4 or 5 ft. apart in width and 10 or 12 ft. long, placing two long saplings lengthways and two crossways. Over these a sheet or tarpaulin is placed to hang and form a sort of long trough. In the centre, resting on the cross pieces, a rough kind of ladder is placed, and the bundles of rice

are then beaten over the bars of the ladder, which causes the grain to drop into the bag. Some farmers merely nail a few strips across a box or wooden trough, and beat the rice out on this by handfuls. After the grain is beaten from the straw (it is then known as paddy), the next operation is the winnowing. This is done in an ordinary sieve by letting the grain fall on to a sheet in a light breeze, the sieve being held up at a little distance; its weight causes the sound grain to fall on the sheet, whilst the light grain, bits of straw, &c., are wafted away to one side. The paddy is then carefully collected and placed in the sun, spread out for a few days to get thoroughly dry, when it is bagged and stowed away in a dry barn, or else taken away to the miller for turning into the article of trade and commerce with which we are more familiar, and known as rice and not paddy. The straw, after the grain is threshed out, is spread out to dry or cure, or else it is fed to the stock. A great deal of nutriment remains in the stalk at the time of threshing, and I believe it would make up into a splendid ensilage if desired to be used when other feed is scarce. I should be pleased to hear the results if any of our enterprising farmers will give it a trial.

MILLING THE RICE AND PREPARING THE CROP FOR MARKET.

This is a most interesting operation, and for the want of the necessary machinery the rice industry has lain dormant for several years in the Logan district. Every credit must be given to Mr. F. W. Peek (the writer of this article) for the energy and enthusiasm he has displayed in reorganising the industry, and the farmers, through the medium of the Logan Farming and Industrial Association, who took the matter up, believing that a great benefit would result to the district if only carried out in a systematic manner. The matter was ably discussed at their meetings. The Agricultural Department was written to for advice, and their assistance was given as far as possible to facilitate the objects sought to be obtained. It was from information supplied by the Department that the farmers were induced to co-operate in the purchase of a new and better variety of seed, a quantity of White Java—900 lb.—being purchased and distributed at first cost among the farmers; next, a small experimental patch was started, the Department supplying rice seed of other varieties, which are now being tested for their producing and milling qualities, the seeds from this source being again redistributed free of charge to those willing to grow them and still further test the various kinds submitted.

With the large increase of area planted, the want of a mill began to make itself felt. The prices offered for Queensland-grown rice were very low, principally owing to no local mills in Southern Queensland being established at that time. Again, the Department of Agriculture was appealed to, and the address was obtained of the latest up-to-date firm of manufacturers of rice-milling machinery. This was the Engleburg Huller Co., of Syracuse, U.S.A., who were promptly written to for information, and price-lists and catalogues were received from them. A meeting of the farmers was called, and an endeavour was made to get a co-operative mill, but without success, the general opinion being that growing and manufacture were two different branches of the business, and that milling would be better undertaken by a local sugar-miller, who would have the necessary engine power to work the rice-mill at times when the sugar season was over. This was eventually the plan adopted. Mr. Wm. Heck, who owns a sugar-mill on Pimpama Island, sent for and erected the necessary buildings and machinery as an adjunct to the sugar-milling industry. A neat weatherboard structure, the dimensions being 28 ft. long, 18 ft. wide, and 22 ft. high (two story), was erected on stumps to keep the floors dry—an essential in ricemilling operations—a floor being placed about 10 ft. high from the basement floor and extending the full length of the building. Upon this floor is erected the Engleburgh Huller and Polisher, a neat little machine known as the "No. 4 size," and capable of treating half-a-ton of dressed rice per day. The paddy, being run into the hopper of the machine, falls on to a cylinder which revolves at high speed and most effectually "hulls"—that is, rubs off the cuticle or outer skin—and polishes the grain in one operation. The pollard or residuum from the rice (hulling and polishing) falls on the floor, whilst the grain itself descends to the lower or basement story of the building by means of a shoot which conducts it into a machine placed to receive it, and known as a grader, which is worked and fed automatically from the machine above. There are four sieves or sifters in this grading machine which separate the broken grains, and also the polished rice into first, second, and third quality, the rice being caught in bags or boxes placed to receive it. It is then ordinarily ready for market, but Mr. Heck has added another machine to his mill, known as an improved winnowing machine; this

machine, by a series of cogs and cranks, makes the rice pass through another set of sieves, and, at the same time, the wind from a rotary fan contained in the machine and driven at a high velocity clears off any impurities of husk, dust, &c., that may be with the rice after leaving the grading machine, and completes the milling operations by finishing the product in a perfectly clean and highly polished state. Samples of this rice were exhibited at the last National Agricultural Society's Show in Brisbane, and submitted to experts, who expressed themselves as pleased at the improved samples displayed, which were equal to any imported rice of the same variety and very little different from the best Japan.

THE RICE CROP—WILL IT PAY?

This is the question invariably put to the writer whenever advocating the growing of rice as one of the crops to be successfully undertaken in the coastal districts of this State.

In the first place, take the cropping. In ordinary situations, with only fair cultivation, from 30 to 40 bushels of 60 lb. of paddy can be obtained per acre, which is double the wheat yield, the average crop of wheat being from 15 to 20 bushels per acre. I know in some instances these quantities have been exceeded in both crops, but I give a fair average for comparison. The value of wheat per bushel ranges from 3s. to 3s. 6d., whilst the value of rice sold to the local mill averages from 4s. to 5s. per bushel delivered at the mills. Then dry rice chaff is of great value as a feed for stock and horses, and I feel sure, if placed on the maket and once fairly tested, it would command a ready sale. The straw is less hard, and, when well dried, compares favourably with oaten straw, and a fairly low estimate would give (according to variety grown) from 3 to 4 tons per acre, of an estimated value of £2 to £3 per ton, or an average to the grower per acre of straw and grain of £15 10s. per six months' crop. Of course, in favoured districts two crops can be obtained in the year—that is, where frosts do not appear. Then the above figures would have to be doubled as a yearly income, but, in the Logan district, only one crop of rice is taken, to be followed by a late crop of some other kind, such as oats, &c. Of course, the greatest benefit is derived by the grower on a large scale if he does his own milling. A glance at the prices paid for paddy and the prices now obtainable for the finished product will be worth consideration. Taking the current prices of rice, at the time of writing, in the Brisbane market, duty paid, best Japan is £24 per ton. The commonest quality of imported rice, "Rangoon," fetches, duty paid, £19. This price gives a fair margin of profit to the local miller if he sells at £18 per ton. The samples being milled this season at the Pimpama Island Mill are of very high grade, and closely resemble "Patna" in shape of grain, but slightly darker in colour. Taking then, the local rice at £18 per ton market value, to produce which 1 ton 10 cwt. of paddy would be required (according to records taken at recent trials) to be milled, of a value of £12 9s. 9d.; this would leave a margin of £5 10s. 3d. I will add here that paddy rice is bought locally like wheat at 2,240 lb. per ton, deducting the cost of milling, the average of about £2 per ton leaves the miller a net profit of £3 10s. 3d. per ton. To this must be added the value of the pollard, which also is of great value as feed for calves, pigs, or poultry, when steamed and then mixed with separator milk. Its commercial value is certainly not less than £2 to £3 per ton.

The following is taken from the Brisbane "Observer" of 29th June, 1901:—

"We were to-day shown a sample of rice grown at Pimpama Island, Moreton Bay. It resembles Patna rice in shape of grain, but is darker in colour. Qualified experts who have seen the sample say that it is the first really high-grade rice that they have seen grown in this State, and as it can be marketed at from £18 to £18 10s., should command a ready sale. The commonest quality of imported rice, Rangoon, fetches £19, duty paid, here just now, while for Japan rice £24, duty paid, is asked by the distributing houses."

The price quoted for the mill such as I have described, and which is so constructed that it can be duplicated or extended at a very small cost is, for the No. 4 machine, with a capacity of not less than half-a-ton per day, together with grader, &c., about £130, delivered at Brisbane. Of course, the buildings are extra, and the power required to drive the machinery; but worked in conjuction with any existing sugar-mill, or sawmill, &c., it would prove of great value to the district, and a source of profit on the outlay to any enterprising millowner.

FUTURE PROSPECTS OF THE RICE INDUSTRY.

Like all other crops, rice has its enemies and diseases; it has a kind of rust, smut, &c., and in some parts of Queens-

land grubs will take the roots, but up to the present the grub has not caused any trouble in the Logan district. The rust has yet to be dealt with, and I think this will be accomplished by experimenting with various kinds of rice seed till we meet with a rust-resisting variety. It is probable now, that under Federation the importance of rice culture will receive the attention it is worth. A large sum of money is annually expended in importing the product into the Commonwealth States. I would therefore advise all farmers to give rice a fair trial, especially as we are growing varieties that can now be classed as fairly successful on our coast lands, and where a fair average rainfall can be partly depended upon. The value of rice grown simply as fodder to cut green is great for stock feed, the stalks being sweet, juicy, and succulent, and giving a good return per acre, and all stock will eat it with avidity. The question of labour does not enter largely into rice cultivation; as I have pointed out, although a tropical product there is every facility for cultivation by present mechanical methods—that is as far as the Aus or upland rice is concerned; the Aman or Boro varieties being swamp rices needing irrigation I have not yet heard of as being grown to any great extent, and they probably will not be for some time, if at all, owing chiefly to the heavy outlay required for a suitable water supply and an irrigation plant, which can be dispensed with in growing the beforementioned varieties of upland rice, which have proved most suitable for existing conditions and our present agricultural methods of cultivation and harvesting. Of this I am certain, that the rice is one of our coming crops which, together with coffee, will prove of great benefit to this State particularly, and a further source of wealth to our producers. The market for rice in Australia is a growing one, and it will take years before the supply overtakes the demand. Our farmers need not fear to grow the crop and invest in this industry, which will return a fair amount of profit for the labour and outlay required to produce an article which only requires care in selecting and planting the varieties to suit the market requirements. I am sure the efforts or our producers will be crowned with success, and I shall be pleased with the part I have taken in assisting the modern development of rice cultivation in Queensland.

REGISTRAR-GENERAL'S STATISTICS OF RICE PRODUCTION AND IMPORTATIONS FOR THE YEAR 1900.

Total area planted in Queensland	... 319 acres
,, quantity produced (paddy)	.. 9,275 bushels
,, average would equal of clean rice	.. 320,617 lb.
The net imports of rice for 1899 were	..9,283,933 lb.
Of the value of	.. £50,099

The above figures represent the position as to production and consumption, and would therefore be about 3·34 per cent. of the total requirements of this State only.

[The total annual production of rice in the United States of America, which, in 1866, was 2,000,000 lb., has now reached 350,000,000 lb. It will take 8,000 large railway cars to handle the crop this season. Rice lands have risen from £2 per acre to £8 per acre; hundreds of miles of irrigation canals have been constructed. Rice has been the redemption of the prairie lands of Texas and Louisiana. In ten years the worthless lands of these two States will produce the world's demand in rice. An acre there produces 20 sacks, worth from 10s. to 16s. per sack. Where are the Queensland farmers in the race?—ED. "Q.A.J."]

THE PRODUCTION AND CONSUMPTION OF CACAO.

(From the *Philippine Agricultural Review*, Vol. II., No. 5, May, 1909.)

The "Gordian" has recently published (July 23, 1908) some interesting statistics regarding the production and consumption of cacao during the past few years. It appears that while the production for 1907 may be considered satisfactory, upon the whole it is 400,000 kilograms less than that of 1908 and 3,000,000 kilograms less than that of 1904. This deficit is due solely to a shortage in the production in Ecuador and the Dominican Republic, the output of these countries being 8,000,000 kilograms less in 1907 than in 1906.

The table which we reproduce below gives in kilograms the exportation of cacao from the principal cacao-producing countries for the years 1906 and 1907:—

PRODUCTION.

Country.	1906.* Kilograms.	1907. Kilograms.
Brazil ...	25,135,000	24,528,000
St. Thomas ...	24,619,560	24,193,980
Ecuador ...	23,426,897	19,670,571
Trinidad ...	12,983,467	18,611,430
Venezuela ...	12,864,609	13,171,090
English East Africa ...	9,738,964	10,471,090
Dominican Republic ...	14,312,992	10,101,374
Ceylon ...	2,509,622	4,699,559
New Granada (Colombia)	4,931,530	4,612,100

* One kilogram equals 2·20462 avoirdupois lbs.

Country.	1906. Kilograms.	1907. Kilograms.
Feranado Po ...	1,557,864	2,438.821
Jamaica ...	2,505,608	2,218,741
German Colonies ...	1,367,977	1,966,236
Haiti ...	2,107,905	1,850,000
Dutch East Indies ...	1,849,847	1,800,153
Cuba ...	3,271,969	1,689,668
Surinam ...	1,480,568	1,625,274
French Colonies ...	1,262,090	1,387,219
St. Lucia ...	716,200	750,0 0
Dominica ...	572,948	580,000
Congo Free States ...	402,429	548,526
Other Countries ...	1,000,000	1,000,000
Total ...	148,618,046	148,136,537

Regarding the exportations from Ecuador we may add that the official reports have confirmed, with a difference of several thousand kilograms, the figures of the "Gordian" (19,703,804 kilograms instead of 19,670,571 kilograms). The estimated crop for 1908 in this country amounts to over 30,000,000 kilograms.

The production of 1,387,219 kilograms attributed to the French Colonies is distributed as follows:—

	Kilograms.
Guadalupe	781,511
Martinique	502,789
Congo	74,733
Madagascar	19,041
Guiana	3,807
New Caledonia	2,352
Ivory Coast	1,993
Reunion, Mayotte and Indo China	953

Among the German Colonies Cameroon leads with 1,797,614 kilograms, Samoa follows with 116,500 kilograms, and Togo with 52,122 kilograms showing an enormous increase over the preceding year.

The record for the English Colonies of West Africa is as follows:—Gold Coast 9,504,000 kilograms, and Lagos 970,745 kilograms.

CONSUMPTION.

In consumption of cacao for the year 1907 the United States leads with 37,526,505 kilograms, then comes Germany with 34,515,400 kilograms, France with 23,180,300 kilograms, England 20,159,472 kilograms, Holland 12,219,249, Switzerland 7,124,200, Spain 5,628,239, Austria 3,471,700, Belgium 3,253,967, Russia, Italy, Canada, Denmark, etc., with a total of 7,619,809 kilograms.

BANANA CULTIVATION.

(From the *Queensland Agricultural Journal*, Vol. XXIII., Pt. 2, August, 1909.)

Notwithstanding the belief still held by some—that the banana, the plantain, the fibre-producing banana of the Phillipine Islands, and the wild banana, so plentiful in the scrubs of North Queensland, belong to different families—botanists are very clear on the point that all are members of one family. So closely are the banana and the plantain related that it is impossible to say where the banana ceases and the plantain begins. All varieties known to-day sprang originally from the native wild plants of the Asiatic islands known as *Musa sapientum*. The fruit of the wild banana contains scarcely any edible flesh. Its leathery skin encloses a large number of black seeds, adhering to a mid rib, and covered with a gummy substance something like bird lime. In no cultivated variety can any seed be detected, although we occasionally notice small black spots in the flesh in regular rows. These are probably the faint traces of seed which have not been entirely eliminated by cultivation. Semler says that all cultivated bananas have been derived from *Musa troglodytarum*, which is a native of the Moluccas. This plant, unlike other wild bananas, bears edible fruits in bunches which stand upright, not hanging down like the cultivated fruit.

It is supposed by some that the wild banana of North Queensland could be, by cultivation, brought to bear edible fruits. No doubt they could, but the experimenter would have to live to over one hundred years to enjoy the fruits of his labour. His time will be better occupied in reproducing the cultivated plant. As the latter have no seeds, this is done by suckers from the roots.

The rank luxuriance of the growth of this class of fruits, their handsome foliage (writes Mr. H. Benson, in his "Fruits of Queensland"), their productiveness, their high economic value as food, and their universal distribution throughout the tropics, all combine to place them in a premier position.

As a food, it is unequalled amongst fruits, as, no matter whether it is used green as a vegetable, ripe as a fruit, dried and ground into flour, or preserved in any other way, it is one of the most wholesome and nutritious of foods for human consumption. It is a staple article of diet in all tropical countries, and the stems of several varieties make an excellent food for all kinds of stock.

In Queensland the culture of bananas is almost confined to the frostless belts of the eastern seaboard, as it is a plant that is extremely sensitive to cold, and is injured by the slightest frost. At the same time, bananas, particularly the low-growing kinds, thrive in the Southern parts of the State where frosts are of frequent occurrence. Good crops of

fruit have been grown year after year on the Brisbane River and on Oxley Creek, where potatoes, pumpkins, and sweet potatoes have been killed by frost. As a rule, the taller the variety, the warmer and moister must be the climate. The banana also thrives best in the neighbourhood of the sea, the plant containing a certain amount of salt, which may be looked upon as necessary for its well-being.

In the Southern part of the State its cultivation is entirely in the hands of white growers who have been growing it on suitable soil in suitable localities for the past fifty years. Mr. Benson says he saw a plantation that was set out twenty years ago, and the present plants are still healthy and bearing good bunches of well-filled fruit, so that there is no question as to the suitability of soil or climate. Bananas do best on rich scrub soil, and it is no detriment to their growth if it is more or less covered with stones (as may be verified by a visit to the banana groves at Brookfield, near Brisbane), so long as there is sufficient soil to set the young plants. Shelter from heavy or cold winds is an advantage, and the plants thrive better under these conditions than when planted in more exposed positions. Bananas are frequently the first crop planted in newly burnt-off scrub land, as they do not require any special preparation of such land; and the large amount of ash and partially burnt and decomposed vegetable mould provide an ample supply of food for the plant's use. Bananas are rank feeders, so that this abundance of available plant food causes a rapid growth, and produces fine plants and correspondingly large bunches of fruit weighing as much as from 60 lb. to 80 lb. Though newly burnt-off scrub land is the best for this fruit, it can be grown successfully in land that has been under cultivation for many years, provided that the land is rich enough naturally, or its fertility is maintained by judicious green and other manuring. In newly burnt-off scrub land all that is necessary is to dig holes 15 to 18 in. in diameter, and about 2 ft. deep, set the young plants in it, and partly fill in the hole with good top soil. The young plant, which consists of a sucker taken from an older plant, will soon take root and grow rapidly under favourable conditions, producing its first bunch in from ten to twelve months after planting. At the same time that it is producing its first bunch it will send up two or more suckers at the base of the parent plant, and these in turn will bear fruit, and so on. After bearing, the stalk that has produced the bunch of fruit is cut down; if this is not done, it will die down, as its work has been completed, and other suckers take its place. Too many suckers should not be allowed to grow, or the plants will become too crowded, and be consequently stunted and produce small bunches. All the cultivation that is necessary is the keeping down of weed growth, and this, once the plants occupy the whole of the land, is not a hard matter. A plantation is at its best when about three years old, but remains profitable for six years or longer; in fact, there are many plantations still bearing good fruit that have been planted from twelve to twenty years. Small-growing or dwarf kinds, such as the Cavendish variety, are planted at from 12 to 15 ft. apart each way, but large-growing bananas, such as the Sugar and Lady's Finger, require from 20 to 25 ft. apart each way, as do the stronger-growing varieties of plantain. Plantains are not grown to any extent in Queensland, and our principal varieties are those already mentioned, the Cavendish variety greatly predominating. In the North, the cultivation of this latter variety is carried out on an extensive scale, principally by Chinese gardeners, who send the bulk of their produce to the Southern States of the Commonwealth. The industry supports a large number of persons other than the actual producers of the fruit, and forms one of our principal articles of export from the North. As many as 20,000 or more large bunches of bananas frequently leave by a single steamer for the South, and the bringing of this quantity to the port of shipment gives employment to a number of men on train lines and small coastal steamers. The shipment of a heavy cargo of bananas presents a very busy scene that is not soon forgotten, the thousands of bunches of fruit that are either piled up on the wharf or that are being unloaded from railway trucks, small steamers or sometimes Chinese junks, forming such a mass of fruit that one often wonders how it is possible to consume it all before it becomes overripe. Still, it is consumed, or, at any rate, the greater portion of it is, as it is the universal fruit of the less wealthy portion of the community, the price at which it can be sold being so low that it is within the reach of everyone. A banana garden in full bearing is a very pretty sight, the thousands of plants, each with their one or more bunches of fruit, as where there are several stems it is not at all uncommon to find two or more bunches of fruit in different states of development on the same plant, forming a mass of vegetation that must

be seen to be appreciated. This is the case even with dwarf-growing kinds, but with strong-growing varieties, such as the Lady's Finger, the growth is so excessive that the wonder is how the soil can support it.

Bananas do remarkably well in Queensland, and there is practically an unlimited area of country suitable for their culture, much of which is at present in a state of Nature. Only the more easily accessible lands have been worked, and of these only the richest. Manuring is unknown in most parts, and as soon as the plantation shows signs of deterioration it is abandoned, and a fresh one planted out in new land, the land previously under crop with bananas being either planted in sugar-cane or allowed to run to grass. This is certainly a very wasteful method of utilising our land, and the time will come, sooner or later, when greater care will have to be given to it, and that once land has become impoverished by banana culture it will have to be put under a suitable rotation of crops, so as to fit it for being again planted with bananas. The trouble is, as I have already stated, we have too much land and too few people to work it; hence, so far, we are unable to use it to anything like the best advantage. During the year 1904 the production of bananas in Queensland was some 2,000,000 bunches; and when it is considered that each bunch will average about twelve dozen fruit, it will be seen that already we are producing a very large quantity. There is, however, plenty of room for extension, and any quantity of available country, but, before this extension can be profitable, steps will have to be taken to utilise the fruit in a manner other than its consumption as fresh fruit, and this in itself will mean the opening up of new industries and the employment of a considerable amount of labour. I have mentioned twelve dozen as being the average quantity of fruit per bunch, but it is frequently much more than this, and I have often seen bunches of twenty-five to thirty dozen fine fruit grown on strong young plants on rich new land. Although the industry in the North is now almost entirely in the hands of Chinese gardeners, there is no reason whatever why it should not be run by white growers, as is done in the South, and there is no question that our white-grown bananas in the South compare more than favourably with the Northern Chinese-grown article, despite the fact that the latter has every advantage in climate and an abundance of virgin soil. The two photos of bananas are not by any means typical of this industry, as they have been taken during the off season, when the plants look ragged and are showing little new growth, and the bunches also are much smaller than usual. Still, the illustrations will give some idea of the growing and handling of this crop, and will show what a bananas plant and its bunch are like.

HOW VANILLA IS GROWN IN HAWAII.

PROCESS OF POLLINATING THE BLOSSOMS AND CURING THE BEANS—PROFITABLE BUSINESS.

(From the *Queensland Agricultural Journal*, Vol. XXIII, 1, Pt. 2, August, 1909.)

The growing of the vanilla bean of commerce has attained considerable importance in Hawaii, where a number of successful small plantations have been producing for a number of years. Jared G. Smith, late Director of the United States Agricultural Experiment Station in Honolulu, gives the following interesting description of the growing of vanilla in his book, "Agriculture in Hawaii":—

"The vanilla bean is the cured and fermented fruit of a climbing orchid. The finished pods are very dark-brown or black, glossy, somewhat wrinkled on the surface, from 5 to 8 in. long and about as thick as a lead pencil. The vanilla extract of commerce is simply an alcoholic extract.

"The vanilla plant is grown either on a trellis or is planted at the base of a tree, so that it can clamber up the trunk. Any soil is suitable provided the drainage is good. It grows well in regions of abundant rainfall on the Kona (south or south-west) side of the islands. A mean temperature of 65 to 75 degrees gives good results.

"The plants are propagated from cuttings, which are simply lengths of the vine itself, from 2 to 6 ft. long. The length of the cutting has some relation to flower production, the longer ones yielding flowers in a shorter period. The leaves are cut from the lower end of the cutting, and the stripped portion of the stalk is buried horizontally under 2 or 3 in. of soil and rotting leaves. The upper end of the cutting is fastened to the trunk of the supporting tree, to which it soon becomes tightly attached by its aërial roots.

"The vanilla plant begins to flower during its second or third year, and continues flower production until seven or eight years old. Cultivation consists in keeping down the weeds and underbrush in the plantation.

"The vanilla plant only bears pods when the flowers are hand pollinated. This is a delicate operation not difficult to learn. Anyone who attempts it becomes quickly proficient, so that a good many flowers can be pollinated in the course of a day. The pod matures in from six to eight months, becoming hard, thick, and greenish-yellow. They are gathered before ripe.

"The curing process is a somewhat complicated one. After gathering, the green pods are spread out and exposed to the air for twenty-four hours, being roughly assorted into grades according to size. After being graded, the pods are sweated between the folds of woollen blankets exposed to the heat of direct sunshine. During the period of fermentation, the pods turn dark-brown, become soft and leathery, and sweat freely. The pods are manipulated for several days until the proper degrees of colour and aroma have developed. After the fermentation, they are dried in the sun for a few hours and finally in cloth-covered trays in the shade with gentle heat. When fully dried—that is, when the pods no longer lose weight, but are still moist and pliable to the touch—they are packed tightly in tin boxes, and are again manipulated in bulk for one or two months. When completely cured, the pods are sorted to size and colour, tied in bundles, and these packages packed in tin-lined boxes which are soldered when full.

"The yield per acre in Hawaii has been estimated at about 13,000 pods, producing about 120 lb. of finished vanilla beans fully cured and ready for the market.

"The industry is a very profitable one for persons having sufficient means who will give this industry their personal supervision. The price of the vanilla bean depends as much upon the outward appearance of the finished product as upon its actual quality as indicated by aroma and flavour. Care is, therefore, necessary at every stage in the growth and fermentation of the crop.

"Five acres of vanilla in bearing should yield from 400 dollars to 500 dollars worth of beans per acre per annum after the third year. There are vanilla plantations in the Kona district, on the island of Hawaii, and in the Kona district of Oahu, near Honolulu. Much land is still available which is entirely suitable for the cultivation of this crop."

GINGER.

By W. HARRIS, F.L.S.

(From the *Bulletin of the Department of Agriculture, Jamaica,* Vol. I., No. 2.)

GINGER. (*Zingiber officinale,* Rosc.)—is a native of tropical Asia and was introduced to Jamaica during the Spanish occupation of the Island.

Sir Hanas Sloane, 1687-89, states that the plant was then cultivated in all parts of the Island. It is now grown principally in the uplands of Clarendon, Manchester, St. James, Trelawny, Portland and St. Thomas; the total area under this cultivation last year being 260 acres. According to the Collector-General's Report for the year ended 31st March, 1908, the quantity of ginger exported for the year was 15,437 cwts. valued at £40,043.

The amount used locally in the manufacture of ginger-beer, &c., is also considerable.

Soil and Climate.—The virgin soil of the forest produces the best ginger, but a well-drained, clay loam is suitable, and the rainfall must be abundant—80 inches and upwards per annum, with a temperate climate.

Planting.—Pieces of rhizomes, each containing an "eye" or bud are planted a few inches below the surface in holes or trenches in March or April.

Harvesting.—"Plant" ginger is harvested during December and January, but "ratoons" may be gathered from March to December.

The rhizomes are ready for digging when the stems wither, which takes place soon after flowering.

Peeling.—When the rhizomes are dug, they are peeled with a knife specially made for the purpose. This operation requires much care and experience. As a rule, experienced operators peel between the "fingers" of the rhizomes, the other portions being peeled by less experienced workers. This work is always done by women and children. As fast as peeled the rhizomes are thrown into water and washed, the purer the water and more freely it is used the whiter will be the product. The ginger peeled during the day is allowed to remain in the water over night.

Curing.—After washing, the rhizomes are spread out on barbecues or on mats in the sun early in the morning. They are turned during the day, and are taken under cover during cloudy or rainy weather and at night, as if allowed to get damp they become mouldy. The

drying process occupies five to six days, and during this period the ginger loses about 70 per cent. of its weight. After drying it is bleached by washing, and again dried for two days, when it is ready for shipping.

Varieties.—Two varieties are distinguished—"yellow" and "blue," also known as "turmeric" and "flint." The rhizomes of the "blue" are hard and fibrous, yielding a much less proportion of the powder, not so pungent, and, therefore, less valuable commercially than the "yellow."

Returns and Value.- The yield per acre varies and depends largely on the nature of the soil and the method of cultivation adopted. The average return per acre is about 1,200 lbs. of cured ginger. A good crop would yield 2,000 lbs. The value also varies according to quality and the demand. At recent sales in London Jamaica ginger was sold at prices varying from 54s. to 69s. per cwt.

About seventy years ago ginger from Jamaica fetched as much as 180s. per cwt. in London. It was then largely grown by English, Irish and German immigrants, many of whose descendants still cultivate this crop.

THE GRANADILLA.

(From the *Porto Rico Horticultural News*, Vol. II., No. 2, February, 1909.)

This department aims to be of use to house-keepers in Puerto Rico in every way possible, but especially in studying methods of using native fruits and vegetables. Suggestions and recipes along this line or more general lines will be very gladly received from readers.

We will also endeavor to find answers to questions which may be sent in.

This month we have been experimenting with one of the native fruits little used by Americans, and it is surprising how many dishes can be made from it. While some do not care for the flavour of the granadilla, those who like it would do well to try the recipes given below. Perhaps even those who have not been well impressed with the fruit could be persuaded to change their opinion after giving it a fair trial.

The granadilla is the Spanish name for the Passion flower, one species of which is familiar in the United States where it is raised for its beautiful and odd flowers. The particular variety of Porto Rico, the *Passiflora quadrangularis*, differs from the northern kind, however, especially in bearing edible fruit. This is true also of several other varieties of Passion flower, but none have fruit to compare with the granadilla in size. A few varieties are found in Asia, but on the whole the family is native to tropical America.

An interesting story is connected with the naming of the plant by the early Spanish explorers who discovered it. They saw in the flower and vine the instrument of our Lord's suffering and death, so called it Passion flower. The three stigmas seemed to represent the nails used, two in the hands and one in the feet. The five anthers blood-red are the five wounds and the corona is the crown of thorns, though by some considered halo of glory. The ten parts of the perianth symbolize the ten apostles around the cross, Peter and Judas being absent. The hands of the persecutors are seen in the digitate leaves and the scourges in the tendrils. The flower was considered a sort of miracle sent to the first missionaries to signify that the Indians would be converted by the Cross. Important mention is made of it by several church writers of the time.

The Passion flower vine is one of the easiest to grow. In a large part of the Island, especially in the hilly country, it is found growing wild in abundance. It covers fences, sheds, trees, or any other thing handy, climbing by means of tendrils and making a beautiful sight with its graceful leaves and striking purple flowers. No diseases appear to have attacked it, and no animal pests except the rats who are very fond of the fruit. They have been known to jump in mid-air two feet to a hanging fruit.

The root is said to possess powerful narcotic properties, and in some places is used as medicine.

The edible parts of the fruit are two, of quite distinct taste. The seed and the attached coverings are excellent eaten with sugar. They have a pleasing tart taste in contrast to the sweetness of the surrounding flesh.

A contributed recipe for preparing the seeds is as follows :—

Cut a slice off one end of the fruit and pour in half a cup of sugar and a cup of cherry. Allow to ripen for an hour and serve ice-cold, scooping out the seeds into dishes.—N. B. B.

The same person gives the method of making :

Granadilla Fritters,—Choose a firm fruit and cut the flesh into small slices. Sprinkle each with a little sugar and a few drops of lemon juice. Make batter by stirring a teaspoonful of melted

butter into two tablespoonfuls of flour, add a pinch of salt and enough milk to make a thin batter. Add the beaten yolks of two eggs, beat well and then stir in gently the beaten whites. Put the fruit into the batter. Fry the pieces in deep very hot lard. Lay on brown paper to drain. Sprinkle sugar over them and serve hot. N. B. B.

Granadilla Salad.—Cut the flesh of a firm fruit into small pieces and cover thoroughly with a good dressing. Serve ice-cold on lettuce leaves.

Granadilla Sweet Pickles.—This is another fruit which can be utillized for pickling. Select matured but rather green fruit and cut flesh into cubes. Put on the fire in water with a pinch of salt and let boil very slightly. Drain and place in jar. Boil five minutes one pint of strong vinegar, two teacups of sugar, scant teaspoonful of whole cloves, also one of whole allspice, and a tablespoonful broken cinnamon sticks. Pour over fruit in jar. Pour same syrup boiling hot over the fruit the two succeeding days.

Granadilla Buller.—Cut up the flesh and boil. Drain off water and mash. Press out the water of the fruit through a cloth, then add one cup sugar to every three cups of fruit and ground cinnamon to taste. Boil and stir till thick.

Granadilla Pudding.—Cook tapioca thin enough to pour readily. Flavour with lemon juice. Have granadilla cut into dice and sugared a little. Pour the hot tapioca over the fruit, stir and allow to cool. Serve with custard sauce.

Granadilla Sherbet.—Press out the juice from a ripe granadilla. Add two cups of cold water and the juice of two lemons and sweeten to taste. Freeze. When frozen almost hard mix in the well-beaten whites of two eggs and finish freezing beating well.

Granadilla Refresco.—Press out juice of ripe granadilla. Add juice of two lemons and a pint of water. Sweeten and serve ice-cold.

TIMBERS.

THE NEED FOR AN AFFORESTATION BRANCH OF THE FOREST DEPARTMENT.

(From the *Indian Forester*, Vol. XXXV., No. 4, April, 1909.)

In the March issue we reproduced on page 176 an article from *Indian Engineering* drawing attention to the want of attention paid in this country to both deforestation and afforestation, which are rightly described as lying at the very heart of successful forest conservation. There is no getting away from the fact that vast areas all over India have been denuded of forest during the past half century, and the cause of this denudation is to a great extent due to the continued progress of agricultural and industrial pursuits under the "Pax Britannica." At the same time very little afforestation work has been done. We have repeatedly drawn attention to the urgency of afforesting waste lands in order to promote the well-being of agriculture which is the most important industry in the Empire. We have pointed out time after time the advantageous results which would be attained by such afforestation, such as increase of rainfall, regulation of water-supply, prevention of floods and erosion, moderation of climate, improvement of irrigation, provision of a plentiful supply of fuel, fodder and timber for agricultural purposes, saving of manure for the crops and ultimate prevention of famine. Even in conservative England, the question of afforestation has lately received a great deal of attention, and in this issue we are publishing the recommendations of the Royal Commission which has recently been enquiring into the subject. And yet in India where we already have a professional department no steps have been taken to plan and carry out a suitable scheme.

It may well be that many will hold that the Forest Department in this country has not fulfilled its duty in these respects, and certainly there is much to be said for their view. We must point out however that the Department has with difficulty obtained the present scale of staff which is still markedly inadequate for the proper management of the lands already reserved as forests. Every step of progress in forestry has been an uphill fight, and with the opposition that it has met with at every point it is surprising that so much has been attained. Fifty years ago all the lands which are now under the Forest Department were waste lands under the management of District Officers, and it is a strange fact that in

some provinces there are still thousands of square miles of waste lands, the property of Government, which are not yet under the control of the Department. So far then from adopting a regular scheme for checking deforestation and for pushing on afforestation, the Forest Department has not yet been allowed to manage all the existing forest lands, and the first step, we consider, should be that all waste lands owned by Government should be made over to the management of the Department. If it were desirable in any case it could be laid down that the areas were not to be managed for a profit, and that when necessary land should be given up for the extension of cultivation, but while the lands are waste, often with a good deal of forest already existing on them, we strongly urge their being handed over for management to the Department specially trained for the purpose.

We have already stated that the Forest Department as constituted at present has more than enough to do in the management of existing forests, and such matters as deforestation and afforestation on lands outside the reserved forests are beyond its scope, for it would not be possible for the existing staff to do these works in addition to their present duties. The subjects however appeal strongly to every keen Forest Officer, and we strongly advise the expansion of the Department in order to deal with them.

Before going further, it is necessary to state that the work of afforestation is a very different branch of forestry to that of management of existing forests. Forest Officers in India have had little experience as yet in afforestation on a large scale, and though trained in the subject under conditions existing in a temperate climate, they will encounter much greater difficulties in this country on account of the extremes prevailing at different seasons of the year. They will have many problems to solve in India as to the cheapest, quickest and most successful methods of creating forests on waste lands. The choice of species to suit various soils and the methods necessary for successfully propagating the individual species are matters which can only be learned by experience. Unfortunately, in the past, plantations have been as a rule discouraged and artificial reproductive works have been often condemned as waste of money. This attitude we believe arose, first, from the fact that we have not sufficient staff to manage our existing forests properly, and secondly, because we are still in the experimental stage as regards plantations, so that it often happens that money spent on them is not productive. Experience in this case, as usual, must be bought, and if we set to work systematically, it will soon be found out how to afforest various types of soils quickly and cheaply.

We are emphatically of opinion that a separate Afforestation Branch of the Forest Department is needed. We by no means wish to advocate that the Government should commit itself immediately to a vast scheme of reboisement, and as a beginning we think it would be sufficient if one Imperial Officer were specially appointed for this work with an Extra Assistant Conservator or good Ranger under him in each Province. It is probable that all Provincial Governments would be able to put small areas of different classes of waste land at his disposal, and it would be his duty to direct experiments to find out how each class can best be afforested.

By the time it has been discovered how to successfully afforest the various classes of soils, Government will, we trust, be able to adopt a regular scheme for the gradual afforestation of waste lands, with a fair prospect of success, and then the Afforestation Branch could be gradually expanded in order to cope with the work.

In the meanwhile the special Afforestation Officer, in addition to directing such experiments, could inspect and tabulate the waste lands suitable for afforestation, so that by the time that Government is prepared to proceed with a reguler scheme, there would be useful data ready as to the position, quantity, and kind of land available. He could also make enquiries and work out the best methods of obtaining the land. We do not for a moment suppose that Government would acquire all the land. It would be often possible to arange with owners that Government should afforest the areas and hand over all profits to the owners of the land. Similarly when village lands are taken up all profits might be divided among the community concerned. In other cases it might be possible to close areas for afforestation and in return grant a proportion of the profits, and so on.

We must, however, point out that in order to ensure the success of any general scheme of afforestation, it is absolutely necessary to have the people with us, and to gain this end we recommend that a simple primer be prepared for use in all schools throughout the

country, setting forth the advantages of forests to agriculture from all points of view.

The Afforestation Branch might also be required to carefully watch the extension of deforestation on areas outside the reserved forests, to report on all cases in which the denudation of the land would have disastrous, effects, and to submit proposals as to the action which ought to be taken to prevent it.

At first all this would be done in a small way, but we believe that once an Afforestation Branch is started, it will gradually expand and become of more importance if possible to the country in general than the present Forest Department. The latter would gradually expand also, for as areas become successfully stocked and felling become necessary or possible, they would of course be handed over for management to the branch of the Department now in existence.

We believe that in the adoption of this policy is the one key to the prevention of famines, and the progress of such an Afforestation Branch would be watched with intense interest by all the world.

PLANT SANITATION.

MISCELLANEA: CHIEFLY PATHOLOGICAL.

BY T. PETCH.

The publication of the circular on "Pink disease" (*Corticium javanicum*) has evoked a flood of specimens from all quarters. It seems to have been fairly prevalent during the prolonged rains of the last four months. An example on coffee adds another to the list of plants attacked by it in Ceylon; in this instance, the fungus developed its conspicuous pink patches along the fruiting branches. Two most interesting examples were sent from Southern India where it attacks *Crotalaria* interplanted among Hevea, as well as the young Hevea. In one instance, the *Crotalaria* was about a year old, but had not flowered nor been pruned; the stem forwarded was exceptionally woody and measured about three-quarters of an inch in diameter. The disease appears to begin, as a rule, near the base of the stem. One correspondent states "almost the whole of the *Crotalaria*, I have noticed, that has been sown in these parts is covered with the same disease." In such cases the densely grown *Crotalaria* acts as a reservoir of disease, from which it may spread to the Hevea; but it is scarcely possible, without continuous observation, to say whether the attacks on *Crotalaria* and Hevea are successive or simultaneous. The growth of *Crotalaria* in Southern India appears to be much more vigorous than in Ceylon—I have never seen any Ceylon plants which attained the size of these Indian specimens before flowering,—and, in accordance with this, *Corticium javanicum* has not yet been recorded on *Crotalaria* in Ceylon. There does not appear to be any danger in growing *Crotalaria* among rubber in Ceylon at present, and where the growth is so vigorous that it forms a tall jungle, some smaller green manure and cover plant must be adopted, or it must be cut down earlier. From the mycological standpoint any green manure plant which grows tall should not be planted in dense masses; the lower the plant, the less is the danger of disease. A plant which would not exceed a foot in height would be ideal, and could be sown as thickly as wished. There is a tendency to grow manure plants too long. In temperate climates such a crop is often ploughed in at the end of a month; but here the idea always appears to be to make it run as long as possible and to obtain some profit by selling seed. There is little advantage in a green manure plant, as such, until it is cut down and mulched in, but the question is of course complicated by the problem of weeds and wash.

In a recent publication on Hevea diseases, the fungus of "pink disease" is referred to as *Corticium Zimmermanni*. This is another name for *Corticium javanicum*, founded on a series of mistakes. In 1899, P. Hennings named a fungus from Java, *Aleurodiscus javanicus*, and in 1901, Zimmermann named another fungus from Java, *Corticium javanicum*. The latter is the fungus of "pink disease," the former being quite a different species, as the name indicates. Now, all descriptions of fungi are periodically collected by Saccardo and published in a mycological encylopœdia; and as he refuses to recognise the genus *Aleurodiscus*, he changed Henning's name (in 1902) to *Corticium javanicum*. In this

he was quite wrong. He had a perfect right to change the name *Aleurodiscus* if he chose, but he was not justified in using the combination *Corticium javanicum*, because that combination was already in use for another species. When he reached the end of his volume, he discovered Zimmermann's description of our "pink disease" fungus, and, to put matters right, he changed the name of the latter to *Corticium Zimmermanni*. But it is not permissible to correct one mistake by making another, and this renaming cannot stand. Our "pink disease" fungus has first claim on the name *Corticium javanicum*, and, if it is desired to rename Henning's fungus, some other combination must be found. As a matter of fact, nothing of the kind is needed, because Henning's fungus had already been named thirty years previously on specimens sent from Peradeniya, and its correct name is *Aleurodiscus peradeniæ*.

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On many estates lateral branches of Hevea which arose from the first six feet or so of the stem have been cut off; or when the trees forked near the ground level one stem has been removed. In the majority of cases, the branch or stem has been sawn across a few inches from the main stem, thus leaving a "stub" two or three inches long. This was the method recommended years ago before the principles of plant physiology were applied to garden practice. It is now generally recognised that the bark will never grow over such a stub, and that the end always remains exposed and affords a possible point of entry for destructive fungi. As a rule, the stub will die back, though this danger may be avoided by tarring it periodically. The current of water and food passes up and down the main stem, and the stub is sidetracked. Now, the periodic tarring would not be necessary if the bark would grow over the cut surface, and the modern pruner obtains this desired effect by cutting off the branch as close to the main stem as possible. *The cut should be made parallel to the main stem and close to it; it should not be made perpendicular to the branch cut off.* According to the old idea, the cut should be made so as not to injure the bulge at the base of the branch; the modern pruner cuts right through the bulge and endeavours to leave the stem as smooth as possible, *i.e.*, without any projecting remains of the branch. He certainly makes a bigger wound, but as the bark has only to grow on in a straight line, it heals over completely in a comparatively short time.

Pruning off large branches should never be done by a single operation. If they are sawn off close to the stem, the branch falls when partly cut through and usually tears off part of the stem. The first cut should be made about a foot away from the stem, on the under side of the branch, and continued about half way through it. A second cut should then be made two or three inches further away from the stem, on the upper surface, and this should be continued until the branch is severed. Finally the stub should be sawn off flush with the stem. It will be necessary to have two or three coolies on rubber estates trained to remove dead branches and prune where it is considered necessary; they should be taught the difference between tree pruning and chopping firewood. Bailey's Pruning Book should be on the shelves of all planters who have to deal with trees; it is the only book which treats the subject from fundamental principles. Its special parts deal of course with American orchard plants and are not so much required here, but the general parts will well repay careful study.

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The recommendation that coal tar should be used for covering wounds does not meet with the approval of Ceylon planters. From the mycologist's point of view Stockholm tar is too evanescent. I am aware that it has been universally recommended for tea, but there do not appear to be any definite comparative experiments on the subject. One planter informs me that coal tar kills back the branches worse than Stockholm tar, while another assures me that the reverse is the case. I have certainly seen coal tar used in branch canker on tea without any injurious effect. Either will kill the green bark if applied to it, and in this respect Stockholm tar is liable to do most damage because it is more fluid and therefore more likely to run. Stockholm tar is a poor protection against fungi, and in one case, in Hevea, fungi grew on the cut surface three weeks after its application. Modern practice favours coal tar. W. J. Bean, of Kew, writing on pruning in the *Gardeners' Chronicle*, April 21, 1906, states:—"The virtues of ordinary coal tar—not Stockholm tar—as a dressing for cut surfaces are not generally known. All the raw places left by removing branches or stumps of branches should be immediately covered with this antiseptic substance, and the coating should be renewed as often as is necessary till the wound is covered with new bark. The best armour that a tree can have to protect it against fungoid enemies

See p. 431.

TEA SEEDLINGS INFESTED BY "ROOT GALL WORM."

is that which Nature has provided it, viz., its bark. But when accident has produced a flaw in the armour the most efficient substitute is coal tar." Bailey, in his Pruning Book, describes a series of experiments with different substances, in which the wound covered with coal tar healed quickest, but he points out, what is generally overlooked, that rapidity of healing is governed more by the position of the wound than by the preservative used; he expresses a preference for white lead paint, and many orchardists agree with him on this point. Watt and Mann state that vegetable tar, not coal tar, should be used, but they do not give any evidence in favour of their preference. It must be remembered that a book on Tea or Rubber or Cacao must be a compilation, and the compiler cannot be supposed to test every statement. He usually accepts the current tradition; and the tradition brought out from Europe thirty years ago would undoubtedly have been in favour of Stockholm tar. It would seem that the recommendation is an extension of the old doctrine of signatures,—that Stockholm tar, being a vegetable tar, must therefore be most suitable for plants.

ENTOMOLOGICAL NOTES.

By E. ERNEST GREEN,
Government Entomologist.

In the July and August numbers of this journal, I described a case of tea seedlings attacked by the "Root Gall-worm" (*Heterodera radicicola*). The accompanying plate gives a good idea of the appearance of tea roots attacked by this pest.

The 'Red Borer' (*Zeuzera coffeæ*) appears to be unusually prevalent just now. Within the last month numerous specimens have been received from tea estates in various localities. In one case, the borers were found in nursery plants. I have also recorded an additional food plant for this pest, which has occurred in young teak trees in the Matale district.

Specimens of the large Cockchafer grub (*Lepidiota pinguis*) have been received from several localities, where they have been destructive in tea nurseries, feeding on the roots of the young plants. 'Vaporite' will be found an efficient remedy for this pest. If dibbled into the soil (between the rows of plants) it gives off a gas which quickly brings the grubs to the surface, when they fall a prey to ants, birds, and numerous other natural enemies.

'Red Slug'—the caterpillar of the moth *Heterusia cingala*—has attracted attention in several tea districts. This is one of our ever-recurrent tea pests. If noticed in time—when the first brood is confined to a few bushes—the caterpillars may be collected by hand and further trouble prevented.

A limited outbreak of the 'Small Tussock Caterpillar' (*Orgyia postica*) upon tea, has been reported.

Further information concerning the slug pest of Hevea rubber has been obtained, and the name of the slug has been determined. It proves to be *Mariaella dussumieri*, Gray.

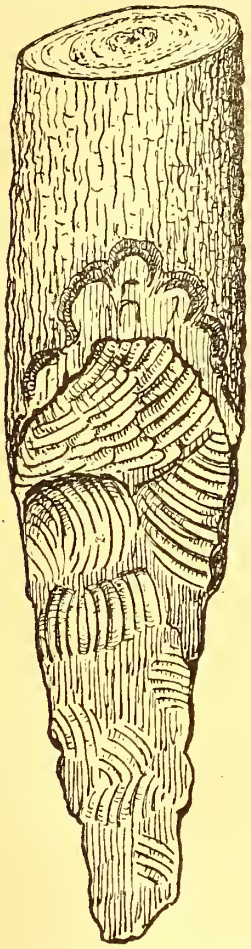
My correspondent writes:—"A rubber tree which has got to the branching stage does not suffer so very much from their depredations. It is the single-stemmed 'wintering' tree—which has lost its foliage—that suffers so badly. The slugs will not permit it to get into leaf again, as they nibble away every growing-point and—in addition to this—'tap' the green bark of the latest formed portions of the stems. The latex can be sometimes seen running down the stem, where these pests have been operating overnight. The supplies also cannot get a start, as the slugs eat off the growing-point close to the stem."

I have seen specimens of some of these afflicted trees. It is evident that the plants have made repeated efforts to throw out fresh shoots, and that each attempt has been promptly 'nipped in the bud.' The top of the plant shows a cushion of these aborted buds.

Some of the slugs were observed to be feeding upon the renewing bark in a wound. It may be mentioned that it was this same species that attracted notice—four years ago—by lapping up the remains of the latex left in the wounds after tapping, with the result that little 'scrap rubber' was forthcoming. (See "T. A." July, 1905, p. 408.)

Several ways of circumventing this pest suggest themselves. Cylinders of freshly tarred brown-paper might be tied loosely round the base of each stem. 'Vaporite' strewn over the surface of the ground round each tree would bar the passage of the slugs. This would be more effective than lime, as its action would not be completely destroyed by rain. Fowls, and especially ducks, will devour the slugs with avidity; but it would be difficult to turn the whole of a rubber plantation into a fowl-run, or to stock it sufficiently. Sliced yams, poi-

soned with a mixture of arsenic and sugar, would be an attractive bait both for this pest and for bandicoots.



Base of Rubber Stem Gnawed by Bandicoot Rats.

That Bandicoot rats can be a serious pest, can be seen from the accompanying figure, which represents the base of a young Hevea tree that has been gnawed completely through by these animals. The characteristic marks of the chisel-like teeth are very clearly shown in the illustration. My correspondent gives me the following account of the 'modus operandi' of this pest:—"The bandicoot always scoops out a hole at one side of the rubber plant and gnaws away the tender root as deeply as possible, that is—as far down the root as he can get, and he invariably gnaws the woody part of the root. The plant then falls to the ground and he can get at the tender bark above." From this account, it appears that the animal deliberately fells the tree in order to feed upon the tender bark that would otherwise be out of its reach. My correspondent informs me that a trial of Danysz Virus produced no appreciable result, and that the offer of a reward of 50 cts. per rat met with no response. He tells me that the Sinhalese plant a poisonous species of yam which the rats are said to eat with fatal results. I think that baiting with artificially poisoned yams—as suggested above—would be equally if not more effective. The rats are most destructive where 'cheddy' has been allowed to grow up amongst the rubber. The removal of this cover will do much to drive away the pest.

I have recently examined a number of diseased branches of *Albizzia moluccana* which had become infested by various small boring beetles. A study of the material showed clearly that the death of the branches was due to a fungus which the Government Mycologist recognizes as a species of *Nectria*, and the beetles had subsequently invaded the diseased wood. I extracted seven distinct species of *Scolytidæ* from these branches, and amongst them was one which I am quite unable to distinguish from the notorious shot-hole borer of the tea plant (*Xyleborus fornicatus*). I have—before now—noticed attempts at infection of young Albizzias growing amongst shot-hole-infected tea; but, in such cases, the insect had invariably failed to establish itself, owing to exudation of gum into its galleries. I have an interesting specimen, in my collection, showing one of the little beetles entombed in a hardened drop of gum, like a fly in amber. In the present case, the *Xyleborus* had—in every instance—attacked the branch in a narrow zone just at the dividing line between the dead and the living tissues. It appeared to find the conditions—at this spot—favourable, for the galleries contained insects in all stages of development. Curiously enough, 'shot-hole borer' has never been found in the tea on this estate. Under these circumstances, the immediate destruction of the *Albizzias* was recommended.

Many of the young sprouting stems of the Giant Bamboos (*Dendrocalamus giganteus*) in these Gardens spring up to a height of one or two feet, and then cease to grow. A closer examination shows that they are dead and decayed. If one of these diseased sprouts is broken open, it will be found to be full of white maggots, which eventually develop into a curious fly with banded wings. This fly, which proved to be a new species, has been named by Prof. Froggatt *Ceratitis striata*. An allied species (*Ceratitis capitata*) is the notorious fruit fly that is so destructive to oranges throughout southern Europe; and all other species—(at least those of which the life-history is known)—are fruit pests. It is curious that our Ceylonese species should have adopted so different a habit. It lays its eggs beneath the imbricating sheaths of the young bamboo sprouts; the maggots eat into the soft heart of the stem and set up decay which effectually stops all further growth. The adult flies may often be observed sunning themselves on the older stems of the Giant Bamboo. To check this pest, it will be necessary to

destroy all the abortive sprouts as soon as it is ascertained that they have ceased growing. As the normal growth of these giant sprouts is extraordinarily rapid—sometimes reaching as much as twelve inches within the twenty-four hours—the stoppage of growth is not difficult to determine. The diseased sprouts should be cut off level with the ground and buried deeply in the soil. They are so full of sap that it would be impossible to burn them.

The large hairy caterpillars of the moth (*Taragama dorsalis*) have been defoliating 'Dadap' (*Erythrina*) trees growing amongst the Hevea on a rubber plantation. It was suggested that—after exhausting the supply of food to be found on the Dadap—they might turn their attention to the rubber trees. To test this point, I deprived some of the caterpillars of their accustomed food and supplied them with Hevea leaves alone. They did not appear to be dissatisfied with the change, but fed freely and eventually completed their transformations. This species must accordingly be looked upon as a potential pest of Hevea rubber, though it has not yet been found actually feeding on rubber in the field. The caterpiller is a large and fairly conspicuous one. It very closely resembles its still larger ally *Suana concolor*, and should be handled with equal caution. (See note on page 136 of the August number).

Mahogany trees, at Kandy, have been partially defoliated by the caterpillars of the 'Green Lappet-Moth' (*Trabala vishnu.*)

Cucumber roots, badly infested by the 'Root Gall-worm' (*Heterodera radicicola*) have been received from the Superintendent of School Gardens. The treatment for this pest consists in a heavy dressing of lime, after which the land should be left fallow, or planted with some crop that does not harbour the worm.

SCIENTIFIC AGRICULTURE.

ACIDITY IN SOILS.

(From the *Gardeners' Chronicle*, No. 1,174, Vol. XLV., June 26, 1909.)

Important as are the nitrogen-fixing bacteria, they form only a small part of the microflora of the soil; other groups of organisms prepare the food of plants; some break down the nitrogenous compounds constituting manure or humus into simpler nitrogen compounds and finally oxidise them into the nitrates, in which form most plants obtain the nitrogen they require. Other bacteria are, from the point of view of the horticulturist, wasteful in that they convert the nitrogen compounds into free nitrogen; others, again (particularly certain microfungi), compete with the crop for the plant food in the soil, and perhaps produce substances which are injurious to plant life. The relative predominance of particular groups of organisms, useful or injurious, can be effected by the farmer or gardener, because the various species of micro-organisms are very sensitive to minute changes in the soil, for example, its acidity or alkalinity.

Soils that are distinctly acid in their reaction are not infrequently met with in nature; when they are in grass they may be recognised by the generally rusty aspect of the vegetation, which consists mainly of shallow-rooting grasses growing in tufts, and by the absence of Clover; when they are under arable cultivation their acidity may be revealed by the presence of such weeds as Spurrey, Sheep's Sorrel, and Corn Marigold, and by the "clubbing" of cruciferous crops.

Similar acid soils have been produced artificially by the long-continued use of sulphate of ammonia as a fertiliser. The best example is afforded by the continuous Wheat and Barley plots on the farm of the Royal Agricultural Society at Woburn; where ammonium salts have been used as the source of nitrogen the land is now almost sterile, Barley refuses to grow at all, and the whole plot becomes covered by a growth of Spurrey. At Rothamsted, where the arable land is sufficiently furnished with carbonate of lime, acidity has not set in, but on the grass plots it has become very marked.

In order to determine the cause of this acidity experiments have been made to see if any purely chemical or physical interactions would take place between the constituents of the soil and solutions of ammonium salts, which would split off a free acid from the latter, but with negative results. The action was found

to be a biological process, the soil is rich in certain moulds and other microfungi which rapidly attack solutions of ammonium salts, and by withdrawing ammonia from their own nutrition, set free the acid. It was shown that the degree of acidity thus produced was approximately equal to the soluble acidity of the Rothamsted plots soon after the ammonium salts had been applied as manure. At the same time, in the soils there was also a very much larger quantity of comparatively insoluble humic acid, which had accumulated year by year as a result of the attack of the mineral acids split off from the ammonium salts upon the neutral humus of the soil.

The first consequence of the acidity of the soil on these plots has been the cessation of the nitrification process, because the bacteria bringing about that change will only work in a neutral medium. Some of the falling off in the yield of these acid plots is thus due to the fact that the grass is driven to obtain its necessary nitrogen from ammonia instead of from the more usual nitrates: at the same time, the mass of micro-fungi with which the soil is permeated competes successfully with the grass for the manure. Whether these fungi also excrete substances more or less poisonous to the grass has not yet been definitely settled. The remedy for this acid condition of the soil lies in the use of lime, which, applied at the rate of 2,000 lb. per acre to portions of the Rothamsted grass plots, has effected a great improvement both in the yield and the character of the herbage.

Another problem of the same order—the secondary effects of certain fertilisers upon the soil—is afforded by the well-known fact that the use of large quantities of nitrate of soda upon heavy soils always makes them very wet and sticky after rain and causes them to dry with a hard, intractable crust. This has been attributed to the attraction of nitrate of soda for moisture, but the amount of water absorbed by the few hundredweight per acre of nitrate of soda which are ever applied is insignificant and could not cause the effects observed. Some of the Rothamsted plots, which have been receiving nitrate of soda every year for the last half century, show these effects to a marked degree, and on examination the clay on these plots was found to be in its most "deflocculated" condition. Clay consists essentially of excessively fine particles, and when a clay soil is in good tilth these particles are largely bound together in loose aggregates, thus giving the soil as a whole a coarser texture. Any working of the soil when wet, or the "puddling" which a potter or brickmaker gives to his clay, breaks down these loose aggregates, and, by giving the clay its most finely-grained condition markedly increases its typical properties of impermeability to water, and shrinkage of drying. It is also found that a trace of any soluble alkali, such as carbonate of soda, will loosen these aggregates and deflocculate the clay.

By further experiments it has been shown that a growing plant fed with nitrate of soda gives rise to a little carbonate of soda, because it takes up more of the nitric acid than the soda base with which it was combined, leaving the latter in the soil combined with the carbonic acid excreted from the roots. It was found possible to extract free carbonate of soda from the plots which had long received nitrate of soda as a manure; one of the grass plots yielded as much as 175 lbs. per acre down to a depth of 3 feet. This alkali then, by deflocculating the clay, is the source of the bad tilth resulting from the use of nitrate of soda.

The bad tilth, which is a serious trouble to many market gardeners who manure heavily with nitrate of soda, cannot be rectified by use of lime, which, being itself an alkali, only exaggerates the trouble. The use of acid manures like superphosphates, and liberal application of soot, will improve matters, but the best plan is to use, instead of nitrate of soda alone as a nitrogenous fertiliser, a mixture of it with sulphate of ammonia. Since the one tends to set free acid and other alkali in the soil, jointly they would leave it unchanged, and they would also come into action successively as sources of nitrogen.

These and other cases of the same character go to show that we must study more closely the chemical and biological actions of fertilisers upon our soils if we are to obtain full value from them, and avoid some of the disadvantages long recognised by farmers as attending their use.

PLANTING EXPERIMENTS AT THE AGRICULTURAL EXPERIMENTAL STATION, ZIMBITI (MOZAMBIQUE).

By W. H. JOHNSON, F.L.S. &c.,
Director of Agriculture to the Companhia de Moçambique.

(From the *Tropical Life*, Vol. V., No. 6, June, 1909.)

The Zimbiti Station is the first of the three Agricultural Experimental Stations which the Companhia de Moçambique has decided to establish for the purpose of testing the agricultural possibilities of the three different zones in its territory. It is situated in the low country, 35 kilometres distant from Beira, and is adjacent to the Beira and Mashonaland Railway. The soil in this neighbourhood varies from a light, sandy alluvial to a rich, heavy clay. A stream flows through the centre of the site selected for the station, and the land in the vicinity of this was thickly covered with large timber trees.

The station is named after a timber tree which is very common in the neighbourhood and known to the natives as Zimbiti. Botanical specimens of this tree were forwarded for identification to the Royal Botanic Gardens, Kew, which resulted in eliciting the fact that it is new to science, and it has been distinguished by the Kew authorities as *Androstachys Johnsonii*, Prain.

It was intended to clear about 20 hectares for preliminary experiments, but as the commencement of this work was delayed until November 18th, 1907, by which time the rainy season was well advanced, it was only found possible to prepare about half this area for the first season's cultivation. The remainder was, however, cleared and prepared for planting before the end of the year (November, 1907, to November, 1908), the period covered by this report.

DEMARCATION OF LAND.

The selected area was divided up into twenty square blocks, each measuring one hectare, and each of these was subdivided into square plots containing 1-16th of a hectare.

The hectare blocks were numbered consecutively from 1 to 20, and the small plots were given a letter of the alphabet from A to P, as shown in the plan sent in with the report.

This system of demarcation considerably facilitates reference to any particular area, and will enable a correct record to be kept of the crops grown in successive years on every portion of the station. Such a record is of considerable importance in estimating the effect of various crop rotations.

STAFF AND LABOUR FORCE.

The European staff consisted of the Superintendent and his assistant, and fifty native labourers were constantly employed.

CROPS.

The principal annual crops grown were cotton, maize, and tobacco. Owing to the delay which occurred in commencing the clearing and ploughing operations, all of these were sown from six weeks to two months too late in the season. The yields obtained cannot, therefore, be accepted as a fair criterion of the probable yields from these crops when grown under more favourable conditions. Previous to planting, the land for each crop was thoroughly cleared of all roots and tree stumps, then hoe-ploughed and levelled.

The Superintendent's records and field notes in regard to each crop were given in schedule form in the appendix to this report when sent in.

Cotton.—Twenty different varieties of cotton were tested, and the following tables furnish details in regard to the results obtained from each.

The Sea Island (Cherinda) plot measured 1-25th hectare, the area of all others being ⅛ hectare. All the plots were similarly treated in regard to weeding and harrowing.

All the plots were attacked by caterpillars and aphis, but these were promptly exterminated by sprayings of Paris green and kerosine emulsion respectively. Grasshoppers were troublesome to young plants, and stainers appeared in each plot as soon as the bolls matured. Vacancies were resown in each plot until a regular stand of plants was obtained.

The yields given in the following schedule still further corroborate the opinion expressed by the writer in previous reports in regard to the advisability of substituting upland varieties of cotton, and perferably the long staple types, for the Egyptian and Sea Island varieties formerly grown in this territory.

Description of variety.	Yield of seed-cotton per hectare.	Yield of lint per hectare	Percentage of lint to seed-cotton.
Long Staple Upland	kilos.	kilos.	
Allen's Long Staple ...	261·04	84 00	32·18
Allen's Hybrid ...	118·40	36·00	30·40
Allen (Cherinda) ...	472·80	152·80	32·32
Griffin U.S.A. ...	417·60	137·6	32·95
Griffin (Cherinda) ...	406·00	106·00	26·1
Cook ...	284·80	88·40	31·03
Commander ...	463·20	123·20	30·55

Description of variety.	Yield of seed-cotton per hectare, kilos.	Yield of lint per hectare, kilos.	Percentage of lint to seed-cotton.
Southern Hcpe ...	309·36	100·8	32·58
Peeler ...	724·80	246·4	33·99
Bailey ...	725·60	240·00	33·07
Moon ...	483·20	160·00	33·11
Mitafiffi Egyptian ...	131·20	41·20	31·40
Jannovitch Egyptian ...	40·64	9·60	23·62
Abassi Egyptian ...	97·92	29·60	30·22
Sea Island (St. Ki ts)...	*Nil*		
Sea Island (Cherinda)...	*Nil*		
Short Staple Upland			
Bates' Big Boll ...	250·72	86·40	34·46
Bates' Favourite ...	244·80	80·00	32·67
Champion Cluster ...	532·40	168·00	31·55
King ...	635·20	224·00	35·26

As it is considered that a yield of 200 kilos and 170 kilos of lint per hectare of short staple and long staple upland cotton respectively is required to ensure a profit in this territory, it will be observed that, notwithstanding the disadvantages under which this cotton was grown, these yields were exceeded in three different instances. The comparatively high percentage of lint to seed-cotton obtained from the long staple upland varieties is specially noteworthy. These varieties rarely yield more than 30 per cent. of lint to seed-cotton, yet this percentage was exceeded in every case, with one exception only. The length, strength and colour of the lint of the various upland varieties compared very favourably with these characteristics of the lint produced by similar varieties in the Southern States of America. The lint of the Egyptian varieties was, however, decidedly inferior in each instance.

Maize.—Eleven different varieties of this crop were experimented with. Caterpillars and grasshoppers did a good deal of damage. The former were eventually checked by spraying with Paris green, but this remedy was not so effective with the grasshoppers. A stem-borer was exceedingly troublesome. As its attacks are principally confined to the interior tissues of the stem, applications of insecticides had little effect in checking its depredations.

The plots for this crop were prepared in a similar manner to those for cotton. The land in each plot was kept free of weeds and harrowed when necessary. Vacancies in each plot were resown.

The subjoined schedule shows the yield of dry grain per hectare of each variety; 1-33rd hectare was sown with the Hickory King variety, and 1-16th hectare with each of the others.

	Yield of grain per hectare.
White Bango	1,968 kilos
Chester County Mammoth ...	1,424 ,,
Golden King	1,376 ,,
Iowa Silver Mine	1,040 ,,
Hickory King	990 ,,
Early Star Leaming	656 ,,
Wisconsin White Dent ...	576 ,,
Champion White Pearl ...	496 ,,
Thorobred White Flint ...	241 ,,
Improved Early Horse-tooth ...	128 ,,
Extra Early Horse-tooth ...	112 ,,

(To be continued.)

THE VALUE OF HUMUS.

(From the *Philippine Agricultural Review*, Vol. II., No. 3, March, 1909.)

The most important fact in humus is that it is the principal source of the supply of nitrogeon in soils. The Minnesota experiment station has found that an increase of 0·5 per cent. of humus in soils means an increase of 245 pounds of nitrogen to each acre. On the other hand, if the supply of humus is allowed to decrease 9·3 per cent. in four years, there is an annual loss of 146 pounds of nitrogen per acre over and above the amount removed in the crop. This shows conclusively that increasing the amount of humus in the soil increases the amount of the nitrogen in the soil; and the decrease of humus means a great loss of nitrogen, not only by being removed in the crop but by leaching away in the drainage waters and by escaping into the air as the humus decays.

Scientists tell us that the humus in soils is never devoid of nitrogen. This is especially true with the soils in arid sections. The humus of soils in New England, which had been farmed for years but had been kept in properly rotated crops was found to have from 4 to 5 per cent. of nitrogen. The humus of the arid soils of California was found to contain as high as 16 per cent. of nitrogen; while in the semi-arid regions of Kansas, Colorado, and Texas the amount of nitrogen in the humus has been as high as 10 to 12 per cent.

The reason that humus contains nitrogen may be better understood when we know that the most of it in soils comes directly from albuminoids in organic matter. While it is true that a little of the nitrogen may be derived from the reduction of ammonium salts and nitrates, the most of it in soils comes from the albuminoids that at one time formed a part of the plants and animals that lived upon the soil. You cannot deposit upon the soil an organic substance, whether it be from plant or animal life, that does not contain

nitrogen in a greater or less amount. When the organic matter decays, the supply of available nitrogen in the soil is increased.

We have found that nitrogen is needed to promote the growth of plants; that if there is not a sufficient amount of nitrogen in the soil we cannot have plants. Since this is true, and since practically all of the nitrogen in soils comes from its humus content, we can see the absolute necessity of humus in soils. All plants, except legumes, obtain their nitrogen from the soil. Legumes have the power to gather this element from the great store in the air, if there is not enough in the soil to promote their growth. Since plants must obtain their nitrogen from the soil, and the soil's supply is obtained principally from humus, we can again see the importance of humus.

1. Nitrogen is the most expensive of the three elements needed by all plants. To grow the common crops more ot it is needed than any of the three plant foods. Since it is the most expensive of plant foods, and so much of it is needed in the production of crops, and its supply can be maintained without any material cash outlay, if we maintain the supply of humus, we can again see the great value of humus in the soil.

2. The presence of humus in soils promotes chemical action on the mineral elements in the soil which are not available at the time for the needs of the plants. The soil may be rich in phosphorus or potash, yet nearly all of these elements may be unavailable for the needs of the plant; they may not be in a state to be utilized so that the growth of the plant will be very slow. If the soil is rich in humus, the acids contained in the humus together with those of the character of crenic and apocrenic acids will act upon the insoluble elements and make them available for the plant.

3. Besides being the source of nitrogen and rendering the mineral elements already in the soil available, the application of humus adds plant food to the soil. Not only do all organic materials add nitrogen, but they all contain a greater or less amount of the other plant foods needed to make soils rich. This is especially true of manures voided by animals raised on the farm, Horses, cattle, hogs, sheep, and poultry void manure rich in nitrogen, phosphoric acid, and potash. The degree of richness, of course, will depend on the animal and the kind of feed and attention received. It the manure of these animals is added to increase the supply of organic matter, the supply of all three plant foods is increased by the amount applied in the manure.

4. Another influence that humus has on the fertility of soils is the fact that it increases the number of earth worms. The farmer's son who wishes to go fishing does not get bait from the clay bank on the hill-side; he knows that no fish worms can be found there. Instead, he goes out behind the barn, where the manure has been thrown for years, and there in the black earth, rich in humus, he digs down and finds the worms. Earth worms of all kinds make their home in soils rich in organic matter. Their presence greatly increases the supply of available plant food. And in some cases they burrow down into the subsoil, and on their return bring up a little of the mineral elements to increase the supply in the surface layer. This may seem like a very insignficant matter; but, after all, it is the little things that count in fertility of soils. This is one of the little things.

5. Besides being valuable by directly increasing the supply in the nitrogen and indirectly increasing the available supply of other plant foods, humus benefits the mechanical condition and texture of the soil. Soils rich in humus are better retainers of moisture than those with but little humus. This property of soils containing humus is of special importance in arid and semi-arid countries. Where there is but little rainfall during the months when crops make their heaviest growth, it is important that the soil have the power to contain and retain moisture as long as possible. If the soil cannot contain much moisture, no matter how much it rains before the dry weather comes, the excess moisture will drain off, and just what the soil can contain is all the crop will have to draw from in the time of dry weather. If the soil can contain a considerable amount of moisture and has the power to retain it, there is a greater probablity of saving the crop when the dry weather arrives.

Experiments show that soils rich in humus have the power to contain more moisture than soils deficient in it. This is true, because pure humus will contain more moisture than sand or clay, and the more humus there is in a soil, the more moisture it can contain. It has been found that 100 pounds of sand will contain only from 25 to 29 pounds of water. If any more than this amount is applied it will leach through and pass of in the drains. One hundred pounds of clay will contain from 40 to 50 pounds; 100 pounds of garden earth, from 85 to 90 pounds; while 100 pounds of pure humus

will contain as high as 190 pounds of water. In other words, the soil of a garden, rich in humus, will contain nearly four times as much moisture as sandy soil devoid of humus.

Not only is the soil rich in humus a better container of moisture, but it is also a better retainer. Experiments show that 88 per cent. of the moisture in sandy soils will evaporate in four hours in hot dry weather such as is usually experienced in arid countries.

In garden loam, reasonably rich in humus, only 21 to 25 per cent. will evaporate in that time. In other words, the garden loam will contain almost four times as much moisture as the sand bank and retain it almost four times as long. Since evaporation may be hindered by establishing a dirt mulch, and since a dirt mulch is more easily established in a mellow soil, rich in humus, it can be seen how valuable organic matter is to the soil in semi-arid regions.

In addition to the above, humus causes the water in soils to rise nearer to the surface. Experiments show that farmyard manure will strengthen the capillary rise of soil moisture. King tells of an experiment where it was found that the surface foot of one acre of manured soil contained over one per cent. more moisture than the same soil unmanured. This proves that the moisture in soils rich in humus rises to the surface. This experiment showed that there were over 15 tons more moisture in the surface foot of an acre of manured land than in the same soil unmanured, while there were nearly 7 tons less moisture in the fifth foot below the surface of the manured soil than the unmanured soil. The humus brought the moisture up where the crops could use it. Not only then does the soil rich in humus contain and retain more moisture, but it places the moisture where it will most benefit the crop.

Every farmer knows that the above is true. He knows that the garden plot will be moist long after the clay bank has dried out and become so hard that it cannot be ploughed. The reason lies in the fact that the garden contains a greater amount of humus, and will contain more moisture and keep it longer than the clay bank will. Therefore, the farmer, who would make it possible for his crops to get moisture longer in a dry time should increase the supply of humus or organic matter in the soil.

6. Then, too, organic matter makes the soil warmer. This may not seem important in southern soils, but nevertheless it is beneficial. It is especially important in the germination of the seed of early crops. The soil that will warm up first in the early spring will, in the majority of cases, make the farmer a larger profit than the soil that is backward about becoming warm.

Humus makes soils warmer for two reasons. First, it makes them dark in colour; there the soil will absorb more heat than the lighter-coloured soils. Black, well-drained soils will warm up earlier in the spring than light-coloured soils. Second, the decay of the humus warms the soil. Wherever vegetable matter decays, there is a certain amount of heat generated. Consequently, those soils that contain a great deal of decaying humus will be warmer than the soils without humus. The decay of any substance is, after all, nothing more or less than slow burning. When anything burns it produces heat. That humus warms every soil the farmer is aware. Compare the garden plot in early spring with the clay bank, and you can soon tell that the garden plot is ready to germinate seed several days before the clay bank.

7. Humus decreases the weight of soils. That is, it makes soils lighter and more easily cultivated. Rich garden soils weigh about 70 pounds per cubic foot; clay soils about 90 pounds. The lighter the soil the easier it is to cultivate and less liable it is to pack. It is more easily cultivated to establish the much-needed dirt mulch and to enable the plant to send its roots deep down into the soil.

MISCELLANEOUS.

LITERATURE OF ECONOMIC BOTANY AND AGRICULTURE.

BY J. C. WILLIS.

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CEYLON AGRICULTURAL SOCIETY.

MINUTES OF MEETING HELD ON 18TH OCTOBER, 1909.

Minutes of a meeting of the Board of Agriculture held at the Council Chamber on Monday, 18th October, 1909, at 12 noon.

His Excellency the Governor presided, and there were also present :—Sir Hugh Clifford, K.C.M.G., Sir Solomon Dias Bandaranaike, Hon'ble Messrs. H. L. Crawford, C.M.G., P. Arunachalam, A. Kanagasabai, Dr. H. M. Fernando and Messrs. R. H. Lock, W. D. Gibbon, E. E. Green, G. W. Sturgess, Tudor Rajapakse, W. A. de Silva, F. L. Daniel, J. D. Vanderstraaten, C. Drieberg (Secretary). As visitors :—Dr. Grenier and Mr. Alfred Drieberg.

Minutes of the meeting held on August 2nd, 1909, were read and confirmed.

Progress Report No. 46 was adopted.

Statements of expenditure for August and September, 1909, were tabled.

The Hon'ble Mr. Kanagasabai moved.—"That it is desirable to open Experimental Gardens in suitable localities in each province, and that as an encouragement this Society offer to pay one-half of the cost of upkeep up to a certain limit, the other half being met from a fund to be raised by the people of the district."

Mr. W. D. Gibbon seconded. Dr. H. M. Fernando spoke in support of the motion. The Hon. Sir Hugh Clifford drew attention to the financial difficulties that may arise from the adoption of the motion, and advised caution in dealing with a proposal of this kind. At the suggestion of the Hon'ble Mr. P. Arunachalam, the subject was referred to a Committee consisting of :—The Hon'ble Mr. Bernard Senior, Sir Solomon Dias Bandaranaike, Dr. H. M. Fernando, Messrs. R. H. Lock, W. D. Gibbon, W. A. de Silva and the Hon'ble Mr. Kanagasabai.

Mr. E. E. Green, Government Entomologist, read a paper on the Insects associated with the Cotton plant in Ceylon (illustrated by mounted specimens), and the Secretary read a note on Nitrifying Bacteria, illustrated by microscopic slides shown by Dr. F. Grenier.

C. DRIEBERG.
Secretary, C. A. S.

CEYLON AGRICULTURAL SOCIETY.

PROGRESS REPORT XLVI.

Membership.—Since the meeting of August 2 the following members have joined the Society :—The Commanding Officer, Salvation Army, Colombo, A. W. Bisset, E. M. Windus, B. S. Doole, R. de Roos Norman, P. A. Keiller, Jerome E. Perera, J. B. Sidgwick, W. Stott, H. Kennedy, A. D. Hartridge, the Director of Agriculture, Trivandram, W. A. Stewart, A. T. Wernigg, A. Alers Hankey, J. W. Bakewell, R. Leslie Melville, R. E. Dais, and L. B, Greig. Total 885.

Official Tours.—The Secretary toured in Alutkuru Korale North and the Katugampola and Hinidum pattus, and visited the Show at Pannala. Agricultural Instructors Wickremaratne, S. Chelliah, and L. A. D. Silva were occupied over the ploughing demonstrations in the Hambantota District, where Mr. L. A. D. Silva is now engaged in supervising the ploughing done by cultivators at the request of the Assistant Government Agent.

Mr. S. R. Breckenridge has been visiting Vandarumulla, Sandivelly, Kiran, Valaichenai, Panichankirny, Vakarai,

Kathiravelly, Kalmunai, Karavaku, Sammanturai, Akkaraipattu, and Kallar, holding ploughing demonstrations with the "Meston" plough and establishing school gardens.

Mr. W. Molegoda has been touring in the Matale District, visiting Nalanda, Galewela, Yatigalpotta, Talakiriyagala, Moragalla, Beliyakanda, Dandubendiruppa, Mamaluva, Kimbissaa, Sigiriya, Talkota, Dambulla, and Naula. He is now in Matale East, and will shortly be proceeding to the North-Western Province, where the Government Agent is arranging a programme for ploughing demonstrations.

Branch Societies and Shows.—The *Telijjawila* Show, held under the auspices of the Weligam Korale Branch, took place on August 25, when His Excellency the Acting Governor was present. The arrangements were excellent, and the products of the korale well represented. The collection sent from the school garden at Paraduwa is worthy of mention. The show was the fifth held in the korale, and the credit of inaugurating and carrying it through is entirely due to the enterprise of Mr. James Wickramaratne, the Mudaliyar, and Honorary Secretary of the local branch.

A school garden show, under the auspices of the Government Teachers' Association, will be held at the *Mirigama* Boys' School (close to the Railway station) on October 30. The show will be confined to produce from school gardens, and should prove particularly interesting, as indicating the progress of gardening among village school boys.

A village show was held at *Pannala* on August 21, when the Government Agent, North-Western Province, the Secretary, Ceylon Agricultural Society, and Mr. N. Wickremaratne, Agricultural Inspector, were present. This was the fourth of the series of similar shows held in the Province. A fifth takes place in December at *Hettipola*. A visit to one of these village shows will convince any one of thier value in encouraging a healthy competition among the actual growers of vegetable produce, and of the interest which the rural population find in them, while enabling the promoters to discover the possibilities and requirements of each district.

It has been decided to hold a show in May next year at *Bandaragama* in Rayigam korale.

The *Harispattu* Branch held a meeting in August. The Agricultural Instructor stationed in the Central Province has placed a light iron plough at the disposal of the Society, and members can get it on loan on application to the Honorary Secretary. A supply of yams was secured from the Government Stock Garden for distribution. There is a likelihood of a district show being held next year. The Ratemahatmaya (Mr. P. B. Nugawela) has undertaken to provide a suitable site for an experimental garden to be worked by the Society.

A special general meeting of the *Dumbara* Agricultural Society has been summoned to consider the arrangements for holding a show next year.

It is likely that the show to be held at *Ambalangoda* at the end of the year will be postponed for early next year.

The catalogue of the *Nuwara Eliya* Show fixed for March, 1910, is in the press, and will be issued shortly.

Experimental and other Gardens.—I paid a surprise visit to Weragoda garden on September 10. It is worked under the auspices of the Wellaboda Pattu (Galle) Branch, and is 25 acres in extent, of which 18 are planted. Originally worked by a syndicate of members, it is now in sole charge of Mr. N. A. S. Jayasuria, a member of the local Society, who finances it and takes all risks. He has already expended a good deal on roading and draining, and is about to erect a small building. I believe that it is the intention of the Mudaliyar (who is Chairman of the Society) to utilize this building for holding Gansabhawa court as a means of bringing the garden directly under the notice of villagers. This is an excellent idea, as the garden is not situated on the high road from Ambalangoda. The land consists of two hillocks, which are given to fruit culture, the intervening depression being utilized for growing vegetables. The lowland is liable to inundation during heavy rains, but this, I understand, may possibly be avoided in future by arrangements for regulating the flow of storm water. The work of the garden is being carried on in a systematic manner, and I have hopes of its developing into a useful distributing centre for the spread of fruit culture in the district. It is to men like Mr. Jayasuriya that the Society must look for voluntary effort in furthering its objects.

Not far from the *Alubomulla* school (in the Panadure district) is an interesting garden started by the teacher, his assistant, and two villagers, who have combined in an undertaking to cultivate snake-gourds on a commercial scale. The total initial outlay was about Rs. 400.

The garden is 2½ acres in extent, and at the time of my visit there were some 12,000 "vines" running on trellises. There is a ready market for the produce, which is conveyed by cart loads to Colombo.

Morape School Garden, situated in Kotmale, has now been set on a proper footing with the assistance of Mr. Molegode, Agricultural Instructor, and the Ratemahatmaya of Pallepone korale, who has kindly given an additional piece of land for the garden. The people of the district are greatly in need of some stimulating influence to induce them to adopt more systematic methods in the cultivation of their high lands.

Twelve *school garden* sites in the Eastern Province have been selected, and will soon be ready for planting, the extent of each varying from ½ to 1 acre each. These are all under the Wesleyan Mission. A number of Church Missionary Society schools in the Kegalla and Kandy Districts have also been noted for aid. Gardening with the aid of school children is being carried on under the Roman Catholic Mission station at Maggona and the Christian Brothers' Seminary at Mutwal. One of the Buddhist school gardens (at Walana) is quite a model in its way. These aided gardens, added to the regular Government school gardens, of which the number has now reached 200, will greatly add to the work of the Superintendent of School Gardens and his assistants; but it is expected that the additional assistant to be allowed next year will somewhat relieve the pressure on their time.

The Assistant Government Agent, Puttalam, has made final and satisfactory arrangements for the experimental garden situated on the Chilaw-Puttalam road. The clearing and fencing of the land has already been put in hand.

PADDY CULTIVATION.

As stated in the last Progress Report, the Society despatched three instructors, Messrs. S. Chelliah, N. Wickremaratne, and L. A. D. Silva to the Hambantota District, to demonstrate the working of light iron implements and ascertain their suitability for preparing paddy land for sowing, in view of the dearth of cattle for "puddling," as the result of the great loss of stock through rinderpest.

The Assistant Government Agent of Hambantota has been good enough to furnish the following report on these demonstrations :—

"I have the honour to inform you that I waited to report on the progress of the ploughing demonstrations until they had taken place at different centres.

"2. There are four large irrigation works in this district, and I arranged the following programme for your instructors :—

Tissamaharama.—August 3 to 8, fields under the Kirindi-oya irrigation works.

Ambalantota.—August 11 to 14, fields under the Walawe irrigation works.

Ranna.—August 16 to 18, fields under the Urubokka irrigation works.

Tangalla.—August 19, fields irrigated by the Kirama-oya.

"3. The important demonstrations were at Tissa and Ambalantota, where rinderpest has been most severe, and where ploughing is unknown. Fields under the Urubokka and Kirama works are ploughed with native ploughs.

"4. On August 3 I attended the demonstration at Tissa. There was a large number of proprietors and cultivators present. The following ploughs were tried : (1) Climax, (2) Meston, (3) Koeri, (4) Cultivator.

"5. Two pairs of bulls used were trained to the native plough. The others used were untrained.

"6. The Koeri plough is undoubtedly too heavy for the Hambantota bulls. The Climax worked admirably, though it is somewhat heavy for the bulls; it also needs strengthening in the plough arm. The Meston is just the right weight for the Hambantota bulls, but the angle of the share to the pole is not right, the point enters the ground too vertically, with the result that (1) the share is liable to stick in the ground, (2) the plough cuts the earth but does not turn over the clods sufficiently.

"7. On the whole, the demonstration was unexpectedly successful. I informed proprietors that I would get any ploughs they desired consigned to me at Hambantota from Messrs. Walkers, in which case they would probably be sent freight free. Twenty persons gave in their names at once with orders for 63 ploughs (20 Climax and 43 Meston) and 6 Cultivators.

"8. Nearly all the landowners and cultivators with whom I spoke are agreed that ploughing at Tissa is possible. Their only fear is that the cattle are not strong enough for the work. That is the reason why they prefer the light Meston plough. The whole difficulty is undoubtedly the cattle, which, of course, are absolutely untrained to the work.

"9. On the following days demonstrations were given on newly opened land. This, too, was an entire success, as the ploughs cut through the roots without difficulty. The Pony plough was also tried.

"10. I was unfortunately unable to be present at the Ambalantota demonstration. I am afraid that this may account for the fact that the people did not respond in the same way in which the Tissa people responded; they require to be talked to and reasoned with a good deal before they will see the advantages of an innovation. Only one man agreed to try the ploughs. He is taking five ploughs, and will plough 40 acres. I afterwards sent for a Vidane Arachchi, and induced him to undertake to plough a similar extent.

"11. I was present at the demonstration at Ranna. The people here readily admitted the good work done by the ploughs, but the fact that they are accustomed to the native plough militates against a successful introduction of any other. Their chief objection is the strain upon the bulls, and the fact that the ploughs are right-handed. I succeeded, however, in persuding them to invest in twenty ploughs as an experiment.

"12. I was not able to go on to Tangalla for the experiments there, and I have not yet received a report from the Mudaliyar.

"13. In conclusion, the most important places are the Walawe scheme and Tissamaharama, as I consider that the future prosperity of these places depends to a great extent on the introduction of the plough. Not much can be expected this year from Walawe, as cultivation begins in the middle of September. I propose to concentrate my efforts on Tissa, where the demonstrations were almost entirely successful. Cultivation for *maha* begins on October 1 and lasts for two months. If the success is to continue, it is then that the most strenuous efforts will have to be made to prevent the cultivators becoming discouraged when the practical difficulties of untrained men and bulls become apparent. I should find it of the greatest service if the Society could send me one of their instructors to remain at Tissa during the period of cultivation.

"14. I am afraid that this report has run to great length, but a detailed description of the experiment might I thought be of interest to you.

"15. I have to thank the Society and their instructors for the great help which they have given to me. If the experiment is successful, it will be due almost entirely to the ability and enthusiasm of the instructors. They had, I am afraid, to put up with no little inconvenience, but they worked throughout with energy and cheerfulness.

L. S. WOOLF,
Assistant Government Agent."

"Hambantota Kachcheri,
August 19/20, 1909."

A subsequent communication from the Assistant Government Agent transmits a letter from the Mudaliyar of West Giruwa pattu, who reports that a very successful demonstration was held at Tangalla, and a number of people induced to purchase improved ploughs.

In a letter dated August 14, from the Government Agent of the Eastern Province, the Society was asked to send a few ploughs of a suitable type with a view to showing their utility. The matter was said to be "very urgent, as the death of buffaloes from rinderpest up to the 31st ultimo amounted 16,948."

Arrangements were at once made for carrying out as far as possible a similar programme to that gone through at Hambantota, and Mr. Chelliah, who had just returned from the Southern Province, was deputed to proceed to Batticaloa and co-operate with Mr. Breckenridge in carrying out the demonstration.

A "Meston" plough has also been sent to Mr. W. R. Bibile, Ratemahatmaya, for a demonstration in Uva. The Ratemahatmaya refers to the gloomy prospect before the cultivators, as the result of the great loss of buffaloes through rinderpest.

At the request of the Government Agent a series of ploughing demonstrations is being arranged to take place at various centres in the North-Western Province. Mr. Molegode, Agricultural Instructor, will be deputed for this work from October 1.

On September 10 I visited Mitiyagoda and inspected a paddy field in which cultivation by transplanting seedlings from a nursery had been done. The following are a few particulars gathered on the spot. Eight measures of seed were used for raising the seedlings for planting an acre 9 in. by 9 in. The field received a dressing of a manure mixture consisting chiefly of fish refuse procured from Ambalangoda, bone dust, and wood ashes. Owing to the absence of rain at the proper time for planting, the operation had unfortunately to be delayed for fifteen days; later on the

heavy unseasonable rains at the time the grain was setting resulted in the flooding of the field and a good deal of damage to the crop. I estimate the loss, judging from the spoilt ears, at about 33 per cent. At the time of my visit, however, there was a fine crop still left, and the sturdy well-tillered paddy plants, with their full ears, standing side by side with the dwarfed and hence almost entirely damaged crop grown from broadcasted seed, furnished an excellent object-lesson for the passer-by, who does not fail to notice it, and will, it is to be hoped, profit by the ocular demonstration afforded of the advantages of the transplanting system. Particulars of the resulting crop and the cost of raising it will be sent to me after the harvest. The cost of transplanting the acre is said to have been just under Rs. 4·50. This experiment was carried out by Mr. Jayasuriya, to whom reference has already been made in my report on the Weragoda Experimental Garden.

Arrangements are being made to carry on systematic paddy cultivation as near Colombo as possible for convenience of control, with a view to testing methods of sowing, tillage, and manuring.

The following statement shows the results of the paddy cultivation by transplanting by the teacher and boys of the Paraduwa Boys' Vernacular School in Weligam korale :—

	Field No. 1.	Field No. 2.
Sowing extent	1 bushel	¼ bushel
Variety of paddy	Wedirata-vi	Wedirata-vi
Manure applied	Keppetiya leaves and citronella ash	Keppetiya leaves and citronella ash
Amount of seed paddy sown in nursery	4 measures	1 measure
Date of transplantation	April 2, 3, and 5	April 6
Results	19 bushels	6 bushels

COTTON.

The want of good seed has been one of the drawbacks in the encouragement of cotton cultivation, and with a view to meet it the Society has placed an order for a large quantity of both Sea Island and Egyptian seed. Half a ton of selected Sea Island seed, from the British Cotton Growing Association, has been received. Applications for this seed should be made as early as possible to save disappointment. They will be met in the order of receipt.

The ginning plant established by a local firm has ceased working, but arrangements are likely to be made, as the result of correspondence between this Society and the British Cotton Growing Association, for work to be resumed so that there may be no difficulty in the way of preparing cotton for shipment.

One of the Society's hand gins has been forwarded to a planter who is growing cotton in Wellawaya. He reports that the gin is working satisfactorily, though the outturn is not as large as he would wish. A large sample of ginned cotton, which has been valued at 72 cents per pound, has been sent to the Society, and may be inspected at the Government Stock Garden.

Encouragaing reports on cotton growing have been received from the Eastern Province.

With the arrival of good seed a fresh effort will be made to interest the cultivators of the north in the product. The conditions in the Jaffna peninsula appear to be particularly favourable, and cotton might well take a place in the rotation of crops.

The fact that there are no local firms purchasing cotton is a decided drawback. On this subject the British Cotton Growing Association is being addressed.

The following letter from Messrs. Donald J. Ross & Co. offers the best terms available :—

"At present we are not purchasing cotton, either ginned or unginned ; but we would be pleased to receive samples of ginned cotton from you for valuation. We have our own people in England and Bombay, and could get you valuations from both markets. Then, if agreeable to yourselves, we would ship, on your own account and risk, charging a small commission for our services. We do not gin cotton, having no machinery for that purpose, and as for cotton seed, it is of little interest unless there is some very good quantity. In the case of small quantities it would be better to dispose of it locally for cattle food. If in large quantities we have the best people in the United Kingdom for disposing of same."

FODDER CROPS.

Congayam grass (*Cenchrus biflorus*) has been well established at the Government Stock Garden. Bandarawela has been found too high for it. Reports from all the districts to which seed was forwarded have yet to be received. In one or two cases it was reported that the seed did not germinate. This, in view of their large size and strong vitality, seems strange. A plot was lately dug up at the Stock Garden, and from its tuberous character it would appear that this grass should stand drought well, but at the same time it would most likely prove—like the tuberous Cyperus (*kalanduru* or "nut-grass")—a troublesome weed on cultivated land. Clumps of the grass as dug up were forwarded to different parts of the Island, and should help to establish it where the seed failed. The

Principal of the Coimbatore College, writing on August 19 last says:—"As this grass is grown in a very dry district, I do not consider that it would grow sufficiently well there for hay. On the farm here it grew 10 inches or 12 inches high when in full ear, and the yield of hay would have been very poor. I see no reason, however, to doubt its capability of being made into hay, provided there is a sufficiently evenly distributed rainfall to ensure good growth."

There is, of course, a vast difference between rainfall there (20 inches) and here (85). The growth of the grass at the Stock Garden, when cut at the beginning of September (after an unusually wet spell), was over 2 feet, and made a good hay. It is intended to import a large quantity of seed, since the grass is so well thought of as a fodder in South India.

Another introduced fodder grass established at the Stock Garden is *Phalaris Gayana*, or "Rhodes Grass."

"Chou Mœllier," a member of the cabbage family, which came with a reputation as a fodder crop, is proving an acquisition as a vegetable. Through the Stock Garden the "leaf cabbage" propagated by cuttings has become well distributed in the low-country, where it is much appreciated, but the "Chou Mœllier" should be even more popular owing to its swollen succulent stem, which boils soft and is delicate enough for the table.

SEEDS AND PLANTS.

Among seeds distributed for special purposes are Carolina Golden Rice, Bengal Gram (*Cicer arietinum*), and Buckwheat (from North India and New South Wales).

Mr. W. A. de Silva is carrying out a trial to test the value of *Sesbania aculeata* as a green manure for rubber.

The usual supply of imported vegetable seeds (approximately 4,000 packets) was received early in October and distributed.

Hickory King maize seed, obtained from the Experiment Station, Peradeniya, has been distributed, in reponse to applications received through the Agricultural Instructors in Badulla, Kegalla, and Matale Districts.

A collection of seed yams from the Gold Coast has been received from Mr. W. S. D. Tudhope, who spent some time in the Island before going out as Director of Agriculture of that Colony. I regret to say that only a few of the yams are likely to grow.

The grafted fruit plants imported for the north-east monsoon planting consisted of mango 266, orange 248, pumelo 53, lime 135, citron 43, pomegranate 96, roseapple 69, guava 86, sapodilla 134, grape 107, or a total of 1,243 plants.

On the application of Mr. L. P. Emerson, Irrigation Engineer, Eastern Province, a collection of fruit plants from the Stock Garden nurseries, consisting of orange, mandarine, Johore jak, pomegranate, rambutan, custard apple, &c., was despatched for planting at Rugam, Tennepitiya, and Illapaduchena.

Cuttings of the new cluster sweet potatoes are now available to members of the Society. Application should be made at the Government Stock Garden.

Tubers of *Solanum commersoni* have been received from the Transvaal Agricultural Department.

IMPLEMENTS AND APPLIANCES.

As the result of the ploughing demonstrations in the Southern Province, orders for over a hundred ploughs have been received from that quarter, the implement most in demand being the Indian Meston plough, the weight and price of which appeal to the small cultivator.

The great loss of cattle through rinderpest in the Batticaloa and Hambantota Districts has severely interfered with the threshing of the paddy crops in these localities, where, as indeed in nearly all parts of the Island, the threshing is done by cattle treading out the grain. The simple hand apparatus recommended by Mr. Bamber, which did not appeal to the cultivators in Batticaloa, has been sent to Hambantota.

Inquiry from every likely source has been made regarding threshing machines that should prove suitable to local conditions, as it is possible that larger landowners—especially of the Eastern Province—will be prepared to pay for a good machine after their recent experience, and with the prospect of getting continuous, efficient, and fast work done, instead of the present slow, unsteady, and unsatisfactory threshing by a system that almost involves cruelty to animals. Information received from Calcutta, Nagpur, and Coimbatore regarding the machines in use in India should assist materially in the selection of a suitable thresher for local use.

ANALYSES AND REPORTS.

The following is the Government Agricultural Chemist's report, which accompanied the analysis of a sample of tobacco soil from Elalai, where the Agricultural Instructor of the Northern Province has been carrying out a series of experiments:—"The soil is

in a fine state of division. The mineral plant food is rich in lime, which is the cause of the alkalinity of the soil; while the magnesia and potash are present in fair quantity, the phosphoric acid is deficient in quantity and availability. The poverty of this soil lies not so much in deficiency of mineral matter as the humus and accompanying nitrogen, and I do not consider that such a soil would grow a good leaf, as most tobacco soils are rich in organic matter, besides mineral plant food. Steps should be taken to plant up only those soils which come up to a high standard in these. An analysis of the tobacco would tell nothing. The quality of the leaf can only be dealt with by a dealer accustomed to handling and valuing it, and, like other natural produce, artificial manure exerts an influence more on the yield than in improving the quality."

A large sample of the resinous secretion found on the leaf buds of *Gardenia latifolia* has been forwarded to the Imperial Institute at the request of the Director.

Specimens of *Euphorbia pilulifera*, the latex of which was reported from Mauritius to contain an organism very similar to that of the sleeping sickness trypanosome, were submitted to the Director of the Bacteriological laboratory, who reported that the bodies are in his opinion not trypanosomes.

GENERAL.

Eri silk culture appears to be making headway in India through the interest which the Imperial Government Entomologist is evincing in its development. Mr. Lefroy has contributed an instructive article on the subject to the July Agricultural Journal of India, which is well worth perusal. An improved hand machine for spinning eri silk has just been received from India. Writing on September 4, Mr. Lefroy refers to another machine which he employs for producing "clean cocoons," *i.e.*, raw cocoons with the caterpillar skin and broken crysalis removed. This cleaning reduces the weight by about 18 per cent. It would appear that various trials are in progress in India in order to ascertain the true market value of Eri silk.

A beginning has been made with the collecting of grains and pulses from various parts of the Island, as well as from India, with a view to exhibiting those new to districts in which Agricultural Shows are held. Cases of a uniform pattern made from samples kindly supplied by the Director of the Royal Botanic Gardens, have been secured for the purpose, and the collection when complete will be an interesting one, and should prove a very instructive exhibit at our local shows.

Mr. W. Molegode, Agricultural Instructor, is giving trial to a system of examinations for school boys so as to encourage and test their general agricultural knowledge. At his request I prepared a set of questions, which were submitted to competitors for a prize (offered by the Agricultural Instructor himself) to the boys of Standards VI., VII., and VIII. in Nugawela, Alawatugoda, and Idamagama schools. The best paper was that sent in by E. W. M. Banda of Idamagama school. The scheme is one which is worth developing, if the necessary funds are available for prizes.

An interesting communication regarding the tinning of sardines has been received from Messrs. Rangel & Riberio, of Goa, in reply to inquiries made on behalf of the Assistant Government Agent of Trincomalee. The firm in question has been engaged in this business over twenty years, and gives much useful information, which is at the disposal of any member of the Society. The proposal to grow sunflowers in order to utilize the oil for fish preserving in Trincomalee does not appear to be feasible.

The Ratemahatmaya of Wanni hatpattu (Hulugalle Adigar) reports that Dindigul tobacco seed sent to him made good growth, and that the leaves are thought well of by the growers. He complains of the poor results of curing as practised locally, in that very little of the true flavour of tobacco is developed.

The Committee appointed by Government to report on a scheme for Agricultural Training in Ceylon has concluded its sittings, and their report was submitted to Government early in the month.

A Commission to deal with the question of Loans to Agiculturists has since been appointed, and has held several meetings already.

C. DRIEBERG,
Secretary.

Colombo, 18th October, 1909.

REPORT ON A VISIT TO INDIA AND CEYLON.

BY H. POWELL.

(From the *Agricultural Journal of British East Africa*, Vol II., Pt. I., April, 1909.)

(*Continued from p. 354.*)

ROYAL BOTANIC GARDENS, PERADENIYA.—To the Economic and Systematic Botanist as well as to those interested in tropical and subtropical plants,

these world-famed gardens afford a rich field for observation and study, whilst to the tourist the Peradeniya Gardens offer attractions in the matter of splendid flowering trees and shrubs which experienced travellers state are difficult to meet with in any other part of the world.

The large number of scientists and others interested in botanical subjects, in addition to tourists, instance the usefulness and popularity of the gardens, and present a striking example of the great value of such institutions in all tropical countries.

The rich collection of economic and gorgeous flowering trees contains many specimens of large size and fine proportion.

The arrangement of the gardens is such, that the formal parts do not mar the appearance of the informal sections, and the visitor will find something of interest on all sides.

The attractiveness of Peradeniya is much enhanced by the "Mahaweliganga" or great sand river which encircles a large part of the extensive grounds.

The Director, Dr. J. C. Willis, to whom I had letters of introduction, was absent from Peradeniya during the ten days I spent in the district, but every opportunity was afforded me by the Assistant Director, Mr. R. H. Lock, for acquiring the information desired as well as seeds and plants.

The Acting Curator was untiring in his efforts to make my visit a success, and it was largely due to his kind personal co-operation that I secured such a fine assortment of plants and seeds at Peradeniya.

Mr. Kelway Bamber, Chemist, attached to the staff, personally afforded me much valuable information on rubber, tea, etc., and to other officers I was indebted for help on matters of agriculture and kindred subjects.

To Mr. W. Austin Goodman of the firm of Walker & Co., Kandy, I was deeply indebted during my stay in the neighbourhood for personal facilities afforded in the matter of visiting various rubber, tea, and cacao properties.

Mr. Goodman had to direct the erection of tea, rubber and other machinery, and in the carrying out of his duties I was invited to accompany him long distances in his motor car, and thus was enabled to see a great deal more of the country than I otherwise could have done in the time at my disposal, in addition to obtaining a practical insight into rubber and tea machinery.

GOVERNMENT EXPERIMENT STATION, PERADENIYA.—The Assistant Director accompanied me over this place and explained the several trials which were being conducted.

A considerable area is under old established cacao, in connection with which the application of such manures as Sulphate of Ammonia and Nitrate of Soda are producing very beneficial results on the growth and yield of the trees.

The disease known as Canker is doing considerable damage to the cacao trees, and cutting out of the affected parts is being constantly attended to. Lessening of the shade trees is having good results on the cacao.

An affection of the cacao pods known as "Helopeltis" is also troublesome. It is said to be caused by a mosquito puncturing the soft outer part of the cacao pod. The insects are sought after and destroyed, which proves the only practical method for keeping the pest under control.

The cacao trees generally yield good crops and many are very prolific,

A plot of one year old plants of the new rubber *Manihot Dichotoma* is doing well.

Tea cultivation is a prominent feature, and manuring with artificial manures and green dressing is being carried out.

Castilloa elastica, the Central American rubber is flourishing. A large plot of well-developed trees being of a tappable age.

An arrangement was made whereby five hundred selected pods of the "Forastero" variety of cacao and fifty pods of "Old Ceylon Red" were obtained for East Africa. The beans were washed and partially dried, and several thousands placed in cases to germinate on the voyage. In order to ascertain the best kind of material in which to pack cacao beans so as to stand a long transit with the least injury to their vitality, a portion of the balance of the seed was placed thickly in layers in biscuit tins, each layer being covered with dry powdered charcoal. The lids were packed on the tins, which were then placed in an ordinary case for shipment.

The remainder of the cacao beans were placed similarly in biscuit tins, but the packing material used was ordinary brown soil of a gritty nature.

On examining the seeds after arrival at Mazeras, five weeks after they had been in the tins, it was found that practically all the beans packed in dry powdered charcoal were dry and dead,

whilst many of those packed in dry brown gritty earth had germinated slightly, and 25 % of the seeds so treated give promise of success.

The protracted sea voyage also had an harmful effect on the tender cacao seedlings, which germinated in cases on the voyage, and a high percentage of the plants has been lost.

Provided the shipment could be made direct from Colombo to Mombasa via Bombay, usually about 16 to 18 days, it is practically certain that fresh cacao beans, if packed in biscuit tins between layers of dry gritty earth, would reach their destination in good condition.

NEW PERADENIYA TEA ESTATE.—This place was visited with Mr. Kelway Bamber, F.I.C., F.C.S., etc., who, with the manager kindly supplied the following notes on tea :—

The output of tea per annum is about 650,000 pounds.

Cultivation, etc.—Well-drained sheltered land where the rainfall is not less than 60 inches per annum will grow tea in Ceylon, but the annual rainfall may be as high as 200 inches and upwards.

It is considered that better tea is produced in the highlands than the lowlands. Where the land is exposed shelter is provided by such trees as *Grevillea robusta* (silky oak), *Erythrina lithosperma*" (Dadap), etc.

The tea bushes are usually planted about 3 ft. by 4 ft., and when about three years old from seed, they are cut back to a height of 12 to 15 inches from the ground, which causes the bushes to spread laterally. When the new shoots are from 9 to 12 inches high they are all broken back to one level, leaving from 4 to 5 inches of stalk, this forms the plucking base, and nothing should be touched below it.

After the first plucking the bushes are cut back to about 2 inches above the previous cut and all crossed branches removed.

For the purposes of utility and appearance it is generally desired that the tops of the bushes should have a level surface.

The young flush shoots up from the axils of the leaves, and when it consists of three leaves and a bud it is ready for plucking, which usually commences from the fourth to the fifth year.

Plucking consists of removing the young shoot containing two leaves and the terminal bud, the third leaf and a bractlike leaf known as the "fish leaf" being left.

Pruning is severely carried out at low altitudes about every eighteen months, but in the higher lands the interval between pruning ranges from eighteen months to five years.

In Ceylon, tea is largely grown on old coffee plantations and manuring has to be resorted to. Farm yard manure is considered to be very good, but its application is expensive. A very common manure is castor oil cake and bones applied at the rate of about half a ton to the acre. Basic slag is also used at the rate of about 2½ tons per acre.

A dusting of lime at the rate of 2 cwts. to the acre is occasionally given and the land forked to a depth of 4 to 6 inches.

As regards enemies, that known as "Shot-hole borer" is said to be the worst, and is doing much damage now in Ceylon. As yet no suitable remedy has been found for this pest.

Red rust is fairly common during dry weather but disappears with the rains.

Some bushes suffer from "Grey blight,' but no serious harm is done.

Curing.—The green leaves are brought to the factory in large baskets by the pickers, who again pick the leaves over, discarding the large coarse ones and any foreign matter, leaving as before stated, two leaves and a bud for treatment. The leaves are then spread on "tats" to wither in the withering house, about one pound of green leaves occupying 10 sq. feet of surface.

The "tats" are made of various materials and placed one above the other.

The operation of withering is considered an important matter, as on its being carried out properly depends to a large extent the quality of the tea.

During the process of withering, the leaves lose from 40 to 45 % of water in 18 to 24 hours, which is the time usually needed in the process.

From the "withering house" which is generally an upper floor of the factory, the leaves are fed through canvas shoots to the rolling machines, each machine receiving about 250 lbs. of withered leaves at a time. The operation of rolling takes about half an hour.

The rolled leaves are then put into the roll breaker which is a form of sieve, in order to separate the coarser leaves from the finer ones. The coarse leaves usually undergo rolling three times, while the fine leaf obtained from the roll breaker, after each operation, is placed on cement

floors, to ferment in a cool damp place free from draught, and occasionally turned until the leaf obtains a coppery colour.

The fermented leaf is next placed on travelling perforated trays in the drying or firing machine, at the top end, and after about twenty minutes to half an hour, comes out at the bottom perfectly dry. It is then passed over sieves and graded, and finally packed in lead lined cases, holding from 90 to 100 lbs., the name and mark stencilled on the package, which is then ready for shipment.

The grades of tea in Ceylon are generally classified thus :—

Broken Orange Pekoe ...	B.O.P.
Orange Pekoe	O.P.
Pekoe	P.
Pekoe Souchong	P.S.
Fannings	F.
Dust	D.

Wherever available, water is preferred as the motive power, though oil and steam engines are considered satisfactory.

Visits were made to other tea estates, notably "Bandarapola," belonging to the Ceylon Coy., Ltd., in the Matale district. Upwards of 1,000 acres of this fine plantation are under tea, the annual output being about 750,000 lbs.

The yield is high, some part of the estate producing as much as 1,000 lbs. of dry tea per acre.

In addition to tea, 1,200 acres are under Para Rubber and tapping is about to commence, and upwards of 200 acres under cacao.

From Peradeniya a railway journey was undertaken through huge stretches of tea in the Hatton and Nanuoya districts.

TEA PROSPECTS IN EAST AFRICA.—With very commendable foresight and zeal Messrs. Caine Bros. have, for several years past, experimented in tea growing at Cainville, Limuru, where the success already attained as regards growth and healthiness of the bushes, as well as the flavour of the hand-prepared leaf, is of a distinctly encouraging nature.

Judging from my observations in the Darjeeling district and the practical insight into tea cultivation and manufacture, in several parts of the uplands of Ceylon, I am strangely of opinion that the soil, altitude and climatic conditions of parts of the highlands of East Africa, particularly around Limuru and the Molo, are well adapted to tea growing.

Much of the land suitable for tea in Ceylon has been already planted up, though many of the estates, as yet, have not come into full bearing.

Should the consumption of tea continue to increase there will be little fear of over-production, and in any case the output from East Africa would not be likely to seriously interfere with the market, as a large part would be needed for local use.

Cheap and regular labour are the chief factors in tea cultivation, provided the situation is favourable for the plant.

When once the plantation has been established, picking of the leaves must be regularly attended to, and for this pickers are paid in Ceylon, as a rule, 25 cents for 40 lbs. of green leaves.

KATUGASTOTA—(KANDY DISTRICT).—Cacao is the major cultivation here, about 726 acres being under bearing trees. The yield of dry cacao for 1908 was 2,500 cwts.

Rich well-drained land in well sheltered humid situations is the most suitable for cacao growing.

Briefly the cultivation and curing of cacoa is as follows :—

The trees are planted 10, 12 or 15 feet apart according to the nature of the soil, the larger distance being for extra rich land.

Weeding and careful pruning must be carried out, one stem only being allowed to each tree.

The first pods are produced from the fourth to the fifth year, and thereafter rapidly increase in number, when, at the tenth year the trees must be said to be in full bearing and continue so for many years.

A good average yield of dry cacao is 3½ cwts. per acre, but on some of the best properties in the West Indies, 10 and even 13 cwt. per acre have been obtained under extra good treatment.

The ripe pods are cut from the trees; taken to the factory, split open and the beans placed in special boxes or other receptacles, to ferment, for three or four days according to the fancy of the proprietor or other circumstances.

After fermentation, the beans are thoroughly washed in tanks, abundance of clean water being necessary.

Should the weather be favourable the beans can be dried on large trays or on cement or other floors in the open. Where the crop is large, however, a special "drying house" is necessary. The cacao drying-house at Katugastota is extensive and most up-to-date, It

consists of three floors with a drying apparatus on the bottom floor. The hot air is provided by means of a break furnace placed outside the building, through the wall of which a number of iron pipes of a diameter of 4 to 6 inches convey the hot air into the drying chamber. The latter is of a semi-circular form, of galvanized sheeting about 5 feet wide and 3 feet or more high at the rounded surface. A fan is placed at the opposite end to the furnace so that the hot air circulates freely in the chamber.

The floor immediately above the drying apparatus is formed of narrow boards laid lengthwise with joints about ¼ to ½ an inch apart. Over this floor coconut matting is laid, on which the wet beans are spread.

The building is well ventilated, and during the worst weather the drying of the beans can be successfully and most expeditiously accomplished on a large scale.

After the beans have been sufficiently dried, they are removed to the top floor, where they are stored or placed at once in bags for shipment.

As in the case of Para rubber there is no data regarding cacao planting in the Protectorate. Experiments are being commenced at the Government Farm, Mazeras, this season, and a year or two should furnish reliable indications in the matter. Rainfall and humidity are the only doubtful factors, the other essentials such as temperature and soil can be found at several parts of the coast, and the necessary shade plants are easily provided.

A drying-house of the kind described should prove useful in East Africa for drying copra, ceara rubber, grain, cotton, fibres, etc.

BERREDWELLA (MATALE DISTRICT).—A small but up-to-date Para rubber factory was seen working here, belonging to the Rosenhaugh Tea and Rubber Company.

The latex is placed in enamelled pails which are about half filled. Into this quantity of latex, from one to two teaspoonfulls of stong acetic acid is mixed, causing coagulation. The masses of coagulated latex are taken out of the pails and placed on tables, by means of a large sharp knife, and cut into sections of about 1½ inches in thickness, the coagulated rubber can also be cut into lengths of several feet above 1½ inches thick.

The pieces of raw rubber are next passed through the washing or crepe machine several times until it has the required thinness.

The washing machine consists of a pair of strong corrugated rollers, on to which a jet of water is continually spraying. The machine is very strongly constructed in order to withstand the great pressure exerted in passing the pieces of rubber through the rollers.

The thin sheets of rubber are passed through a set of smooth rollers and are then ready for drying.

A special "Vacuum Dryer" by Emil Passburg, Berlin, is in use at this factory.

The sheets of wet rubber are placed on perforated zinc trays in the dryer, where the rubber stays for about 2½ hours. The rubber is then taken out and sorted into clear and dark sheets.

When thoroughly dry the rubber is packed is cases like tea chests for export.

The output of dry rubber at Berredewella was about 2,200 lbs. for 1908.

The Vacuum Dryer is not generally in use in Ceylon, as drying can be done successfully by simpler and less expensive methods.

It was understood that the cost of a washing or crepe machine was about £40, though all particulars regarding tea, rubber and such like machinery can be obtained from Walker & Co., Colombo and Kandy.

CEARA RUBBER (*Manihot Glaziovii*).—Many old Ceara Rubber trees are seen in various parts of Ceylon, but systematic cultivation of the rubber has for some years past received little if any attention. Now, however, there is evidence that Ceara is again coming into favour due to improved methods of tapping, and the knowledge that the trees can be tapped and good rubber produced at a much earlier age than was formerly thought practicable.

I discussed the matter of Ceara rubber cultivation with Sir Daniel Morris, at the Colonial Office, who expressed the opinion that the dryer climate of the coast and hinterland of East Africa, compared with West Indies and Ceylon, is seemingly very suitable to Ceara rubber.

Mr. Kelway Bamber and others in Ceylon share Sir Daniel Morris' views as regards the suitable conditions existing in East Africa for Ceara rubber growing.

Both the authorities quoted above hold the opinion expressed by the Government Experts in German East Africa that the future success of Ceara rubber largely depends on a careful selection of seed for propagating purposes from such trees as have proved to be good rubber producers.

OIL AND OIL-CAKE FROM PARA RUBBER SEED.—On one of the estates forming the "Galphele Group" in the Matale District experiments have recently been conducted on a small scale, in extracting oil from Para rubber seed by rolling.

Several gallons of expressed oil were seen by me at this place, and a case of compressed oil cakes, which the manager was shipping to England as samples.

Para rubber trees produce large quantities of seed in Ceylon. The investigations conducted at the Imperial Institute have proved that this oil, which resembles linseed oil, will probably command the same price as the latter commodity, whilst the residue of the seeds from which the oil has been extracted may prove to be serviceable locally as feeding stuff for cattle.

SISAL HEMP (*Agave sisalana*).—At Bangalore and several other places I had hoped to secure consignments of sisal bulbils for East Africa, but personal enquiries were always met with the same reply, that all available bulbils were needed for local supply, or booked up a considerable time in advance. There is now, however, no cause for anxiety regarding a sufficiency of sisal plants for establishing plantations in the Protectorate as apart from recent successful efforts made by several to import bulbils, the field of sisal at the Government Experimental Station, Merihini, has commenced to "pole" which with the plants "poling" at Government House Garden, Mombasa, and large numbers of suckers on the plantations of several sisal planters in the highlands and lowlands, will meet all reasonable demands during the currrent and early part of next year.

In reply to an enquiry of mine as to whether sisal plants produce fertile seed, Dr. H. H. Mann of the Agricultural College, Kirkee, Poona, wrote :—

"I have never found ripe seed develope on Agave sisalana in all my experience."

"They certainly must be a great rarity in the districts I know and of no commercial importance. On the other hand quite a number of the other Agaves do give fertile fruit."

BREADFRUIT (*Artocarpus incisa*).—For some time past the Department of Agriculture has been desirous of introducing the breadfruit plant, and I took the opportunity at Peradeniya to obtain about 30 plants from natives. About 25 of the plants stood the voyage well, and so far appear to be thriving at Mazeras.

The tree was originally a native of the South Sea Islands, and grows to a good size, and on account of its large lobed leaves, is of handsome appearance.

There are several varieties, but in most the fruit is roundish and of the size of a melon.

In the South Sea Islands and the West Indies, the fruit constitutes one of the principal articles of diet of the natives and is relished by Europeans.

The fruit is baked or roasted whole, or cut into slices and boiled or made into soup.

Plants will be propagated for distribution.

MANGOSTEEN (*Garcinia mangostana*).—Several seedling plants were secured at Peradeniya, but they are not doing well.

In good situations in Ceylon, the tree, which is of middling size, and considerable beauty, commences to fruit at the 8th to 10th year.

It is a native of the Malay Islands, where, as in other tropical countries, the fruit is held in high esteem, some authorities describing it as the most luscious of all tropical fruits, having a flavour of a peach and pineapple combined.

AVOCADO PEAR OR MIDSHIPMAN'S BUTTER (*Persea Gratissima*).—Plants of this well-known fruit have been introduced from India and Ceylon, and appear promising.

GIANT BAMBOO (*Dendrocalamus giganteus*).—Native of Malay Peninsular. Introduced into Ceylon in 1856.

This is the largest bamboo known, of which there are several remarkably large clumps in the Royal Botanic Gardens, Peradeniya.

Several seedlings as well as seed of the Giant Bamboo were brought back by me to Mazeras.

The length of the rods is from 60 to 90 ft., and the diameter from 8 to 12 inches.

The rods are used for a variety of purposes, and when cut into sections, just below a node or joint, form excellent pots for plants, water vessels, etc.

DURIAN (*Durio zibethinus*).—Opinions differ as to the advisability of introducing this tree into East Africa.

It is commonly cultivated in the Malay Peninsular, and very large trees are established at Peradeniya. At Dunga in Zanzibar there is also a well-grown tree.

"The flavour of the Durian is said to be unique, and it is certain that no other fruit, of either tropical or temperate clime, combines in itself such a delicious flavour with such an offensive odour—an odour commonly compared with putrid animal matter or with rotten onions. It might be supposed that a fruit possessing such an odour could never become a favourite, but it is said that when once the repugnance has been overcome, the Durian is sure to find favour, and that Europeans invariably become fond of it."

Other interesting plants introduced and so far doing well are :—Cannon-ball (*Couroupita giuanensis*), a large handsome tree with showy flowers and cannon-ball like fruit. Nutmeg (*Myristica fragrans*), the well-known spice. *Bougainvillea lateritis*, the magnificent terra cotta Bougainvillea. *Brownea grandiceps*, a pretty tree with large handsome flowers.

Of creepers or climbers, *Bignonia venusta, Porana paniculata, Antigonon leptopus* (white), *Thunbergia laurifolia* (white and purple) hold a high place.

The plants referred to above and many others newly imported are being established at Mazeras, and though none, as yet, are available for distribution, every effort will be made to propagate them as fast as possible.

Photographic views illustrating the cultivation and preparation of Para Rubber, tea, cacao, and Ceylon are submitted with this report.

In conclusion, I wish to place on record my deep appreciation of the kind assistance rendered me in India and Ceylon by all with whom I came in contact, and I also desire to state that it will be my earnest endeavour to make all the information gained of practical use in the general development of agriculture in the Protectorate.

MODERN AGRICULTURE.

(From the *Louisiana Sugar Planter and Manufacturer*, Vol. XLIII., No. 6, August 7th, 1909.)

Modern agriculture is fast becoming, and, in fact, has already become, almost an exact science. Half a century ago book farmers and book farming were regarded with contempt by the average farmer, and this from the fact that at that time book farmers failed and book farming was a very deceptive guide. At that time book farming was taught in some cases conscientiously and with an earnest desire to be of service to the agricultural community. The trouble then was that some of those interested had some slight knowledge of the subject matter whereof they wrote, but still a very imperfect knowledge, and writing in degree as though they were well informed, committed some outrageous errors that were quickly discerned by the farmers and even by those without any book learning.

All this has now changed and modern biological studies have shown the close relations subsisting between all forms and shapes of living things. We now find that the life of plants shows in its transmission all of the phases of heredity, and many reversions to earlier forms. Plant life and animal life are so closely related that the line of demarcation is scarcely distinguishable, and, in fact, is in dispute. We have plants with what seems to be a digestive apparatus, capable of the solution and assimilation of food, and we have animal life living in active movement in its early history, as the spats of oysters, and yet subsequently inert and immovable as any plant growing in the soil.

That great Missouri statesman, William Hatch, for many years Chairman of the Committee on Agriculture of the House of Representatives in Washington, builded perhaps better than he knew when he framed the now famous Hatch Bill, which provided for national aid to experiment stations in all the States and Territories of the Federal Union. Mr. Hatch recognised the recondite character of the actural work of the farmer, how difficult it was to determine what, or why to do things, and appreciated the many million of dollars lost annually to the farming community by mistakes in the work done, and, of course done without adequate knowledge. While it is true that in nearly every other direction wherein human effort is exercised, conditions half a century ago were far behind what they are now, yet the teachings of half a century have revealed to us the fact that in agriculture we have the most abstruse of all sciences and have so many factors, controllable and uncontrollable, to consider in carrying on agricultural work that as it stands today the modern agriculturalist apparently ought to be a very scentific worker and able to reduce waste to a minimum and to accomplish the greatest amount of work and to secure the very best results with the least outlay of human effort and other expenditure.

The various Experiment Stations carried on throughout the Federal Union have done their share during the last twenty-five years in leading to the wonderful advances made in modern agriculture. The Louisiana Sugar Experiment Station was one of the pioneers in this good work, and we are led to believe that the sugar industry in this State would never have secured its present proportions had it not been for the aid of the station. All these things take time, and it has taken a quarter of a century for us in the sugar industry to progress from the old rule of thumb, then prevailing, up to the modern methods of intense culture and concentrated manufacture.

Our rice planting industry in this State, which is now the largest in the Federal Union, and has been progressing by leaps and bounds during recent years, is in much the same condition as was the sugar cane industry twenty-five or thirty years ago. The experiment station work now inaugurated in this industry and that has been carried on to some extent for several years, will unquestionably show good results in the end. The hearty co-operation

of Secretary Wilson, of the Department of Agriculture, is assured to us and we believe that good results will quickly follow. Among the earlier work done through the efforts of Mr. Wilson was the introduction into this country of some hardy varieties of rice, including what we now familiarly call Japan rice. This rice, however, does not seem to be as much in favour as was hoped for it some years back. It seemed to ripen more slowly and to reach the harvesting season at a period when there are severe storms in this State, and standing rice would be liable to storm injury. The rice grains were short and round and looked more like barley than the handsome, long grains of our present so called Honduras rice. There remains, however, very many problems to be solved in the rice industry just as there remain very many in the cane industry, but such solutions are reached by gradual advance movements and not at one jump as many would suppose.

We have the old adage that experience is a dear teacher and that fools will learn in no other. It is a pity for the agriculturist of to-day to have to commit every error of his ancestors before he shall learn how to reach success, and financial conditions are so changed to-day that those who are sufficiently persistent in their personal conclusions as to exclude from consideration the experience of others are quite apt to fail, as now practically every industry, agricultural, manufacturing, mercantile or otherwise, is carried on at less margins than formerly, and errors made in management have more serious results now than ever before.

Agricultural life for years has been thought to be sufficiently remunerative to justify men of ability continuing in it. In the great States of the West and in fact everywhere in the Federal union we can now find men of great ability in agriculture, who treat their business as an exact science and have solved the problem as to how to make agricultural industry remunerative. The statement made last year that in Minnesota the farmers were the chief buyers of automobiles is said to have been an accurate one, and it shows the trend of modern agriculture.

So many persons have left the country and gone to the great cities that poverty seems to be transporting itself to the cities, and those who are left in the country are now beginning to reap their reward in the high prices that are prevailing generally for the products of the soil. While sugar does seem an exception to this rule, yet rice and corn, the great cereal crops, are both bringing remunerative prices, and the high prices prevailing in the markets for practically every agricultural product must necessarily have their beneficial effect upon the welfare of the producer.

To this wonderful advancement in agriculture and to this softening of the rough edges of agricultural life by promoting in every direction the use of mechanical devices, driven by animal, steam or gasoline power, nothing has contributed more than the work of the experiment stations throughout the United States. The whole force constitutes practically an army of well educated men, thoroughly informed in the specialties in which they are engaged, and all interested directly and competitively by their own personal ambitions in bringing about the very best results that are possible. Such work as this has developed the manufacturing, commercial, transportation and banking interests of the country, as well as the various phases of so-called professional life. In other words, agriculture has now come to take conspicuous place among the industries of the country, not because it employs so many persons, but because those engaged in it are far better educated than such persons were a few decades ago and agriculture is coming to be a profession, as much as chemistry, medicine or law.

Not many years ago two-thirds of the people of the United States were engaged in agriculture. The Civil War withdrew so many hundreds of thousands of persons from agriculture that those remaining learned how to carry on agricultural work with greatly reduced forces. The attractions of city life have drawn hundreds of thousands from the pursuits of their youth, and now Mr. James J. Hill, the famous railroad man of the North-west, says that against two-thirds of the people earning their living directly from the land some years back, now not over one-third are engaged in so doing, and this one-third of the much abused class of agriculturists, abused years ago because of their lack of knowledge, are now abused because of the so-called exorbitant prices that they are getting for their staple crops off the land, estimated by the Secretary of Agriculture to amount to over eight thousand millions of dollars for this year. With wheat at $1·25 a bushel and corn at about 80 cents, we can estimate what the proceeds would be of our expected crop of over three thousand millions of bushels of corn, 660 millions of bushels of wheat, and 11¼ millions bales of cotton. Corn is king and wheat end cotton come next.

These magnificent results in agriculture have been brought about by the wonderful foresight of Congressman Hatch in his persistent advocacy and final success with his now famous Experiment Station Hatch Bill. James Wilson, the Secretary of Agriculture, who now for so many years has been holding this very important post under so many succeeding administrations, has also been one of the most important factors in the recent development of agriculture in the United States. In this connection we believe that we ought also to mention Secretary Coburn, of the Kansas State Board of Agriculture, who has been devoting himself to the promotion and the good of agriculture with all of his great ability, energy and integrity until his name has become a household word throughout the entire country. Secretary Coburn declined the appointment by the Governor of his State as Senator, to represent his State in Washington, believing as he did that he could do more good to his people at home than he could by the advocacy of their interests in Washington.

The immediate application of all this to our agricultural conditions in Louisiana is the fact now apparent to almost everyone that it is only by intense agriculture that we can win success in our life's industrial battle.

REPORTS ON AGRI-HORTICULTURAL SHOWS.

KEGALLA A. H. SHOW,

JULY 2ND AND 3RD, 1909.

BY R. H. LOCK,
Acting Director, R. B. G., Peradeniya.

The writer acted as Judge in Classes I., VIII., and IX.

Class I.—PLANTS IN POTS.

The actual number of exhibits was small except in Section II—Colias, of which an admirable display was made. The individual exhibits were, however, on the whole distinctly good.

The arrangement of the building which contained this class was admirable.

Class VIII.—COCOA.

The exhibits in this class were few and poor as was only to be expected at this season of the year.

Class IX.—RUBBER.

For a district like Kegalla the number of exhibits was distinctly disappointing. Individual exhibits were good and the actual prize-winning samples in each section were quite creditable. The gold medal was awarded to a decidedly valuable batch of Para biscuits.

The Show as a whole struck me as excellent, and there were practically fine displays of fruits, vegetables and native produce.

The Committee deserve the highest congratulations upon the admirable arrangement of the exhibits in all sections.

PANNALA VILLAGE SHOW: AUGUST 21ST, 1909.

BY C. DRIEBERG,
Secretary, Ceylon Agricultural Society.

This village Show was held in the Pannala School rooms on the 21st August, when the Government Agent of the North-Western Province was present. It made the fourth of a series of village shows held in the Province, previous shows having been held at Balalla, Pilessa, and Kuliyapitiya; still another is fixed for December 4th at Hettipola. Speaking generally the vegetables were good, but fruits poor. Snake-gourds, bitter-gourds, sweet pumpkins, ash pumpkins, okras, luffas, chillies, and betel leaves were particularly fine. Beans were badly represented, and good varieties of these will be sent for distribution in the district. Fruits were not in season. Dry grains and native rices made up a good section. School Garden produce was sent from Makundara, Pannala, Dahanakgedera and Kankaniyamulla School Gardens. The best collection was from Makundara. "Rodiya manufactures" consisting of plaited work (mats, baskets, &c.) was an interesting section. Addresses were given by the Government Agent and myself. Agricultural Instructor Wickremaratne was present to assist in the arrangements and confer with the people.

TELIJJAWILA A. H. SHOW. AUGUST 25TH, 1909.

BY N. WICKREMARATNE, A. I.

This Show was held on August 25th, when H. E. the Acting Governor was present. It was the 5th Show held under the auspices of the Weligam Korale Agricultural Society, of which Mr. James Wickremaratne Mudaliyar is the Secretary.

The arrangements, as at previous Shows held in the Korale, left nothing to be desired. The sheds were full, but the quality of exhibits might have been better. Among vegetables, pumpkins, gourds, capsicums, cucumbers, brinjals, cassava and sweet potatoes deserve mention, while in the fruit section, jak, breadfruit, pomeloes, oranges and limes attracted attention. There were also good exhibits of paddy and dry grains, coconuts and jaggery.

Under School Garden produce, collections were sent in by Paraduwa and Dampella Schools. The exhibits of the former were of striking merit. The other sections comprised oils, articles made of coir, dairy produce, cattle, woodwork, pottery, lace, basket work, fishing tackle, &c., which helped to make a very full and interesting exhibition.

MARKET RATES FOR TROPICAL PRODUCTS.

(From Lewis & Peat's Monthly Prices Current, London, 13th October, 1909.)

	QUALITY.	QUOTATIONS.
ALOES, Socotrine cwt.	Fair to fine ...	85s a 90s
Zanzibar & Hepatic ,,	Common to good ..	40s a 70s
ARROWROOT (Natal) lb.	Fair to fine ..	2⅞d a 4d
BEES' WAX, cwt.		
Zanzibar Yellow ,,	Slightly drossy to fair ...	£6 7s 6d a £6 10s
Bombay bleached ,,	Fair to good	£7 10s a £7 12s 6d
,, unbleached ,,	Dark to good genuine ..	£5 10s a £6 5s
Madagascar ,,	Dark to good palish	£6 7s 6d a £6 12/6
CAMPHOR, Japan ,,	Refined	1s 5¾d a 1s 7½d
China ,,	Fair average quality ..	135s
CARDAMOMS, Tuticorin	Good to fine bold	1s 10d a 2s 2d
	Middling lean	1s 7d a 1s 8d
Tellicherry	Good to fine bold ..	1s 9d a 2s
	Brownish ..	1s 3d a 1s 7d
Mangalore ,,	Med brown to fair bold	1s 10d a 2s 8d
Ceylon, Mysore ,,	Small fair to fine plump	1s 1d a 2s 11d
Malabar ..	Fair to good ..	1s 4d a 1s 6d
Seeds, E. I. & Ceylon ,,	Fair to good ..	1s 8d
Ceylon Long Wild ,,	Shelly to good ..	6d a 1s 6d nom.
CASTOR OIL, Calcutta ,,	Good 2nds ..	3d
CHILLIES, Zanzibar cwt.	Dull to fine bright ...	35s a 40s
CINCHONA BARK,– lb.		
Ceylon	Crown, Renewed	3⅜d a 7d
	Org. Stem	2d a 6d
	Red Org. Stem	1¾d a 4½d
	Renewed Root	3d a 5½d
		1¾d a 4d
CINNAMON, Ceylon 1sts	Good to fine quill	10d a 1s 4d
per lb. 2nds	,, ,,	9d a 1s 2d
3rds	,, ,,	7½d a 11½d
4ths	,, ,,	6½d a 9½d
Chips, &c..	Fair to fine bold	2⅝d a 3⅜d
CLOVES, Penang lb.	Dull to fine bright pkd.	1s a 1s 3d
Amboyna ..	Dull to fine	8d a 8½d
Ceylon ..	,, ,,	7½d a 9d
Zanzibar	Fair and fine bright	4¾d a 5¼d
Stems ..	Fair	1¼d
COFFEE		
Ceylon Plantation cwt.	Medium to Bold	65d a 100s
Native	Good ordinary	nominal
Liberian ,,	Fair to bold	43s a 55s
COCOA, Ceylon Plant. ,,	Special Marks	60s a 74s
	Red to good	54s a 59s
Native Estate ,,	Ordinary to red	38s a 54s 6d
Java and Celebes ,,	Small to good red	30s a 85s
COLOMBO ROOT ,,	Middling to good	15s a 17s 6d
CROTON SEEDS, sift. cwt.	Dull to fair	30s a 35s
CUBEBS ,,	Ord. stalky to good	80s a 90s
GINGER, Bengal, rough ,,	Fair	30s
Calicut, Cut A ,,	Small to fine bold	60s a 85s
B & C ,,	Small and medium	52s a 60s
Cochin Rough ,,	Common to fine bold	38s a 42s
	Small and D's	37s 6d
Japan ,,	Unsplit	36s
GUM AMMONIACUM ,,	Sm. blocky to fair clean	25s a 60s
ANIMI, Zanzibar	Pale and amber, str. srts.	£16 a £18
	,, ,, little red	£13 a £15
	Bean and Pea size ditto	75s a £12 10s
	Fair to good red sorts	£9 a £13 10s
	Med. & bold glassy sorts	£6 10s. a £8 10s.
Madagascar ,,	Fair to good palish ...	£4 a £8 15s
	,, ,, red ..	£4 a £7 10s
ARABIC E. I. & Aden ,,	Ordinary to good pale	25s a 32s 6d nom.
Turkey sorts ,,		29s a 47s 6d
Ghatti ,,	Sorts to fine pale ...	20s a 42s 6d nom
Kurrachee ,,	Reddish to good pale ...	20s a 30s ,,
Madras ,,	Dark to fine pale ...	15s a 25s ,,
ASSAFŒTIDA ,,	Clean fr. to gd. almonds	120s a 140s ,,
	com. stony to good block	15s a 100s ,,
KINO	Fair to fine bright	6d a 9d
MYRRH, picked cwt	Fair to fine pale	80s a 115s
Aden sorts ,,	Middling to good	55s a 70s
OLIBANUM, drop ,,	Good to fine white	40s a 50s
	Middling to fair	25s a 35s
pickings ,,	Low to good pale	6s 6d a 17s 6d
siftings ,,	Slightly foul to fine	13s a 15s
INDIA RUBBER lb.	Fine Para bis. & sheets	9s 2d
	,, Ceara ,, ,,	9s
Ceylon, Straits,	Crepe ordinary to fine..	8s 6d a 9s 3d
Malay Straits, etc.	Fine Block ..	9s 2d
	Sce.p fair to fine ..	6s 8d a 6s 11d
Assam	Plantation	5s 6d a 6s
	Fair II to crd. red No. 1	4s 6d a 5s 2d
Rangoon	,, ,,	3s 2d a 4s 2d

	QUALITY.	QUOTATIONS
INDIARUBBER. *(Contd.)*		
Borneo	Common to good	1s 8d a 3s
Java	Good to fine red ..	2s 6d a 4s 4d
Penang.	Low white to prime red	2s a 3s 3d
Mozambique	Fair to fine red Ball ...	4s 3d a 5s 4d
	Sausage, fair to good ..	4s 2d a 5s 2d
Nyassaland	Fair to fine ball ...	3s 8d a 4s 8d
Madagascar	Fr to fine pinky & white	3s 2d a 4s
	Majunga & blk coated ..	2s 6d a 3s 2d
	Niggers, low to good ..	1s 6d a 2s 8d
New Guinea	Ordinary to fine ball ..	3s 2d a 4s 6d nom
INDIGO, E.I. Bengal	Shipping mid to gd violet	2s 10d a 3s 8d
	Consuming mid. to gd.	2s 6d a 2s 10d
	Ordinary to middling	2s 2d a 2s 5d
	Oudes Middling to fine	2s 6d a 2/8 nom.
	Mid. to good Kurpah	2s 2d a 2s 6d
	Low to ordinary	1s 6d a 2s
	Mid. to fine Madras	1s 5d a 2s 4d
	Pale reddisb to fine	1s 11d a 2s 4d
	Ordinary to fair	1s 8d a 1s 10d
	,, ,, good pale	1s 7d a 2s 1d
	Wild	4d a 5d
MACE, Bombay & Penang per lb.	UG and Coconada	5s a 5s 6d
Java	Jubblepore	4s 9d a 5s 10½d
Bombay	Bhimlies	4s 9d a 6s 3d
MYRABOLANES, cwt	Rhajpore, &c.	4s 6d a 5s 3d
Bombay ,,	Calcutta	5s a 5s 6d
	64's to 57's	1s 3d a 1s 6d
Bengal ,,	110's to 65's	4½d a 1s 2d
NUTMEGS— lb.	160's to 115's	4d a 4½d
Bombay & Penang ,,	Ordinary to fair fresh	14s a 16s
NUTS, ARECA cwt.	Ordinary to good	9s a 11s 6d
NUX VOMICA, Cochin	,, ,,	6s a 6s 6d
per cwt. Bengal	,, ,,	6s 3d a 8s
Madras	Fair merchantable	4s 9d
OIL OF ANISEED ,,	According to analysis	3s 8d a 4s
CASSIA ,,	Good flavour & colour	2d a 2½d
LEMONGRASS ,,	Dingy to white	1½d a 1¾d
NUTMEG ,,	Ordinary to fair sweet	2¼d a 1s
CINNAMON ,,	Bright & good flavour	11¾d a 1s 1d
CITRONELLE ,,		
ORCHELLA WEED—cwt		
Ceylon ,,	Mid. to fine not woody...	9s a 11s
Madagascar ,,	Fair ...	9s
PEPPER– (Black) lb.	Fair ...	4¼d
Alleppee & Tellicherry	,, to fine bold heavy ..	3¾d a 4½d
Ceylon	,, ...	4d
Singapore ...	Dull to fine	3½d a 3¾d
Acheen & W. C. Penang	Fair to fine	7d a 8d
(White) Singapore ,,	Fair	7d
Siam ,,	Fair	6¼d
Penang ,,	Fair to fine bright bold	—
PLUMBAGO, lump cwt.	Middling to good small	—
chips	Dull to fine bright ..	—
dust	Ordinary to fine bright	—
SAGO, Pearl, large ...	Dull to fine	15s a 16s 6d
medium .	,, ,,	14s a 15s
small ...	,, ,,	12s a 13s 6d
SEEDLAC cwt.	Ordinary to gd. soluble	50s a 65s
SENNA, Tinnevelly lb.	Good to fine bold green	4½d a 7d
	Fair greenish	3¼d a 4d
	Commonspeckyand small	2d a 2¾d
SHELLS, M. o'PEARL—		
Egyptian cwt.	Small to bold ..	25s a 115s nom.
Bombay ,,	,, ..	21s a 115s
Mergui ,,	,, ,, ...	£8 a £8 15s
Manilla ,,	Fair to good ..	£5 12/6 a £10 10s
Banda ,,	Sorts	25s a 30s nom
TAMARINDS, Calcutta...	Mid. to fine bl'k not stony	11s a 13s
per cwt. Madras	Stony and inferior ..	4s a 5s
TORTOISESHELL—		
Zanzibar, & Bombay lb.	Small to bold ..	8s a 31s
	Pickings ..	3s a 18s 6d
TURMERIC, Bengal cwt.	Fair	8s
Madras ,,	Finger fair to fine bold	17s a 18s
Do. ,,	Bulbs [bright	14s a 15s
Cochin ,,	Finger .	15s
	Bulbs ..	13s 6d
VANILLOES— lb.		
Mauritius .. } 1sts	Gd crystallized 3½ a 8½ in	10s a 16s 6d
Madagascar ... } 2nds	Foxy & reddish 3½ a ,,	9s a 12s 6d
Seychelles .. } 3rds	Lean and inferior ...	9s a 9s 6d
VERMILLION ..	Fine, pure, bright .	3s
WAX, Japan, squares	Good white hard ...	145s

THE SUPPLEMENT TO THE

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COMPILED BY A. M. & J. FERGUSON.

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RUBBER FROM BANANA PLANTS.

A correspondent sends us for comment from Georgetown, British Guana, a copy of a local paper containing a letter from Mr. George C. Benson on the above subject. Mr Benson writes:

To dispel all doubt as to whether or not the banana, is a rubber-producing plant let the following simple plan be followed :—

Cut one of the lower branches of a banana tree near the trunk, and then let the falling juice drip either into a wine-glass or into an egg-cup till it is about half full ; then let either the wine-glass or the egg-cup stand for about six hours, after which moisten the fingers and take off the film that has formed on the top of the juice. If the fingers are moist or wet, the film can be pressed and rubbed between the fingers, and then a beautiful and pink-like ball of very soft rubber will be the result.

One mature banana tree will give from 5 to 7 lb. of marketable rubber when it is properly admixed. The rubber is fully worth 60 cents per lb. All that the farmer now gets is about 20 cents per bunch for his plantains or bananas.

6 lb. of rubber at 60 cents	..	$3 60
1 bunch of bananas	..	16
		$3 76
Less cost of admixing 6 lb. of rubber, about		36 ?
Estimate about	..	$3 40

The idea is not entirely a new one. Some years ago in July, 1898, to be precise, Otto Zürcher, of Kingston, Jamaica, took out a patent (No. 15569), for an improved process for the extraction of India-rubber.

According to this invontion bananas and tho fruit of other Musaeæ are cleaned with waterjet and then cut from the stems when about half ripe. They are then cut crosswise, and the surrounding leaves, skin and stem, are separated. The inner portions are drained of liquid and afterwards extracted by placing them radilly in a centrifugal machine, or with turpentine or other solvent in a vacuum. The outer parts are cut and crushed and extracted similarly. India-rubber separates from the liquids produced, on standing or by treatment in a centrifugal machino.

India-rubber may be obtained from parts of other plants by the same processos. The patentee then points out the advantages which were to be expected to accrue from the production of rubber from cultivated plants (thus anticipating present developments), and claims that by his invention and the employment of his improved process, the "entire and immense yearly crops of musa-plants and the like, and bananas in particular, can be utilised to the fullest extent, apart from any question, as to the size, weight, or ripeness of the said fruit."

From our knowledge of the anatomy of these plants, we do not believe the idea is worth going on with. Sections through various parts of the banana plant, for microscopic examination, can be seen by arrangement at the offices of the "India-Rubber Journal." We think that a study of the latex chanels, as revealed in the sections referred to, will not lead to any display of enthusiasm on the part of the investigator.—*India-Rubber Journal*, Sept. 6.

PARA RUBBER IN SOUTHERN NIGERIA.

In view of the possible extension of rubber plantations in Southern Nigeria, Mr N C McLeod, the Deputy Consorvator of Forests in the Colony, was recently deputed to visit the Federated Malay States and the Straits Settlements in order to study the methods there employed for the cultivation of the Para rubber tree (*Hevea Brasiliensis*) and for the collection and preparation of its rubber. Tho report which Mr Mc Leod has submitted to the Southern Nigeria Government gives a *résumé* of the information which he collected, and also contains somo particulars regarding the suitability of Southern Nigeria for the cultivation of the Para tree which are of general interest.

The Para tree was introduced into Lagos in 1895, when a number of trees were raised from seed in the gardens at Ebute Metta. At the end of 1907, the average girth of six of these trees, taken three feet from the ground, was 31 inches, the largest tree being 45 inches in circumference. In 1902 twenty-five Para trees were planted at the Olokemeji Gardens (Western Province), and their average girth at the end of 1907 was just over 12 inches, the largest tree measuring 17 inches in circumference. At the Calabar Gardens (Eastern Province) there are also a number of well-grown trees about six years old.

Since 1905 a large number of Para seeds have been imported from the Straits Settlements for trial in the three provinces. In the Western Province the Forest Department has established two small experimental plantations of 26 and 10 acres at Agege and Mamu respectively, whilst at Sapele, in the Central Province, Messrs. Miller Brothers havo a plantation of nearly 200 acres under Para. In the Eastern Province also a large number of Para plants have been raised and distributod.

The result of these experimental trials show that for the first two or three years the seedlings suffer considerably from drought during the dry season. In 1907, for oxamplo, the loss from this cause at Sapele and Agege was about 30 per cont, but at Mamu it was less than 10 per cent. After that period, however, the trees survive the dry season with comparative safety, and compare favourably in rate of growth with those in other countries, such as India and Ceylon, which have a marked dry season.

With reference to the general suitability of Southern Nigeria for the cultivation of the Para tree it is pointed out that the colony includes a dry and a wet zone, the line of demarcation between which is approximately 6° 15′ north latitude. Places to the north of this line have a rainfall of less than 76 inches per annum, whilst those to the south have more than that amount. Thus at ten places in the dry zone the annual rainfall varies from 40·92 to 74·7 inches, with an average of 53·16 inches, whilst at eight places in the wet zone the figures range from 87·08 to 251·49 inches with an average of 128·67 inches. In the dry zone the average range of temperature is normally between 95° F. and 54° F.; in the wet zone the daily maximum during December to March is 88° F. and the minimum during May to August is 73° F.

It is evident from these records that there are many places in the wet zone of Southern Nigeria which have an annual rainfall practically equal to that of the Federated Malay States, although the distribution throughout the year is not so even. The range of temperature is also very similar to that of Malaya and the soil is quite as rich. It seems probable, therefore, that the Para tree could be successfully cultivated in parts of the wot zone of Southern Nigeria, and Mr. McLeod suggests that the formation of plantations of the trees should be encouraged in suitable localities where they would not interfere with the palm-oil industry.—*Imperial Institute Bulletin.*

RUBBER ON THE IVORY COAST.

How great a proportion of West African Rubber comes from the Ivory Coast is shown by the French Blue Books, which give the total exports of rubber from the Ivory Coast for the three years 1905, 1906 and 1907 as amounting to 4,071,136 kilos (8,975,226 lb.) The Ivory Coast alone, therefore, during these years exported more than three times as much as the whole of Ceylon, India, Burma and Assam imported into England.

Accompanying the Prospectus is a report of M. Greville-Réache, a very well-known explorer, who acted as Lieutenant to Monsieur Boushon Brandeby, Secretary of the College of France, and to Col. Binger, late Administrator of the Ivory Coast, after whom the capital Bingerville, is named, M. Gerville-Réache has held the following appointments under the French Government:—Scientific expedition to French Oceana (Pacific Islands), 1886; expedition to Senegal and the Sudan, 1889; expedition to the French Congo, 1892; and the Ivory Coast, 1894. He resided on the Ivory Coast for many years, and is thoroughly acquainted with rubber forests in West Africa. He spent a considerable time last year on the property and himself tapped the trees—

From M. Gerville-Réache's report in the Prospectus of the Ivory Coast Rubber Estates, Ltd., it will be seen:—

Title.—1. That the boundaries of the two Concessions aro clearly set forth in the official title deeds, and that the title deeds are in order.

Cheap Transport.—2. That it is possible to land the rubber at Liverpool or Hamburg from the estate in 23 days, and although not mentioned in M. Gerville-Réache's report, it appears that steamers of the Elder-Dempster Line and the Woermann Line call at Blieron and Tabou.

Labour.—3. That there is no fear of any scarcity of labour, which frequently happens in other districts, and that the natives are peaceful and hardworking and very anxious to get European goods, which they can only get by their labour.

Cost of Production.—In regard to cost of production, M. Gerville-Réache says:—"I have carefully calculated the cost of production on this property as follows:—

		£	s.	d.
Wages paid to the natives for tapping trees, collecting the rubber and delivering of 50 kilos	frs. 23.00	0	19	2
Transport by small steamer belonging to the Company from the property to the port of Blieron	,, 0.50	0	0	5
Expenses of storage, packing, bags, &c., at Blieron	,, 0.60	0	0	6
Freight to Liverpool or Hamburg	,, 2.50	0	2	1
Loss in weight, 5 per cent. on selling price	,, 12.50	0	10	5
Brokerage, 2 per cent. on selling price, 5 francs per kilo in Europe	,, 5.00	0	4	2
General Expenditure in Europe	,, 25.00	1	0	10
Total	frs. 69.10	£2	17	7

say 1 fr. 38 per kilo" (which works out at well under 8d per lb.). "This rubber is now sold in Europe at 4s 4d a pound. For our purpose we will take only one-half of this price, that is 5 francs

		£	s.	d.
per kilo, 50 kilos by 5 francs =	frs. 250.00	10	8	4
Deduct expenses as above	,, 69.10	2	17	7
Profit	frs. 180.90	£7	10	9

that is to say, 3 frs. 62 profit per kilo" (which works out at a profit of 1s 4d per lb.).

NUMBER OF TREES AND OUTPUT.—4. He noted on the property many kinds of well-known valuable rubber-producing trees and vines, including "Kicksia Africana," "Ficus Elastica," and "Landolphia," and estimated the number of fully-grown trees at 240,000.

PROFIT ON TRADING.—5. He states that he was also impressed by the opening which offers for trading with the natives and mentions places where stores could be profitably started, thereby providing a return cargo for the steamers carrying the Company's rubber.

ESTIMATE OF PROFITS.—6. M. Réache considered very carefully the best method of working the concessions, and calculated :—

THE FIRST YEAR'S PROFITS.

Sale of 100,000 kilos Rubber ..	£15,083	6	8
Profits on trading at Blieron and at Toke	7,812	10	0
Total ..	£22,985	16	8

THE SECOND YEAR'S PROFITS.

Cavally Rubber, 150,000 kilos ..	£22,625	0	0
Tabou Rubber, 100,000 kilos ...	15,083	6	8
Sales to Natives ...	11,718	15	0
Total ..	£49,427	1	8

(Which works out at more than sufficient to pay 14 per cent for the first year, and 32 per cent for the second year, taking the Rubber at only half its present price.)

After further development, he calculates that the profits should be as follows:—

THE THIRD YEAR'S PROFITS.

Cavally Rubber, 150,000 kilos ..	£22,625	0	0
Tabou Rubber 150,000 ,, ..	22,625	0	0
Rubber purchased 100,000 ,, ..	15,083	6	8
Sales to Natives ..	10,416	13	4
Total ..	£70,750	0	0

THE FOURTH YEAR'S PROFITS.

Cavally Rubber ..	£22,625	0	0
Tabou Rubber ...	22,625	0	0
Rubber purchased ..	22,625	0	0
Sales to Natives ..	13,000	0	0
Mahogany ..	6,250	0	0
Palm Oil ..	2,083	6	8
Palm-kernels ..	1,666	13	4
Total ..	£90,875	0	0

(Which works out at more than sufficient to pay 47 per cent for the third year, and 60 per cent for the fourth year, taking the rubber at only half its present price).

CLIMATE.—M. Gerville-Réache states that Europeans who take the ordinary precautions necessary in tropical countries can perfectly well stand the climate of the Ivory Coast, and that the Cavally district is the most healthy part of the Colony. Mr. Molyneux confirms this and states that it compares very favourably with other portions of the Coast, and says that "with ordinary care and given a fair constitution a man has no reason to fear ill-health."

FACILITIES FOR SALE OF RUBBER.—The following letter has been received from Messrs. A Jimenez & Sons, who have consented to act as Produce Agents for the Company :—

65, Fenchurch-street, London, E.C., August 6, 1909.—The Directors, The Ivory Coast Rubber Estates, Ltd., London.

Dear Sirs,—We have received your inquiry with reference to rubber coming from the Ivory Coast, and we are pleased to inform you that such rubber is readily saleable. The present prices of the kinds you mention are as follows :

Niggers Fair Red	5s to 5s 1d per lb.
Niggers Fair White	3s 10d to 4s per lb.
Niggers Fair Pinky	3s 4d to 3s 5d per lb.
Hard Cakes	3s 6d to 3s 7d per lb.
Twists	about 3s 8d per lb,

The "Red Niggers" quality, which we understand you are principally interested in, would always be more saleable than the other sorts. The "Twists" quality has been arriving only in small quantities. In considering the price of rubber you must bear in mind that the rubber market is easily influenced by the existing shortage or surplus, and sometimes the prices fluctuate considerably.—We are, dear Sirs, Yours faithfully, (Signed) A. JIMENEZ and SONS.

(In this prospectus the Rubber has been calculated at only 2s 2d per lb).—London *Times*, Sept. 2,

RUBBER FROM SOUTHERN INDIA.

A number of rubbers prepared from Ceara, Castilloa, and Para trees growing in the Government Experimental Gardens at Kullar and Burliar in the Nilgiri Hills, have been examined recently at the Imperial Institute, with the following results :—

CEARA RUBBER (*Manihot Glaziovii*).—This rubber was prepared at Kular, and bore the following label :—

"No. 1. Ceara rubber from trees planted in the Government Experimental Garden, Kullar (1,300 feet), Nilgiris, in April, 1902 ; collected February 1908." It weighed 9 oz., and consisted of six biscuits of pale amber rubber, clean and well prepared. The physical properties of the rubber were very good. The results of the chemical examination were as follows :—

	Sample as received Per cent.	Composition of dry rubber. Per cent.
Moisture ...	2·8	--
Caoutchouc ..	80·2	82·5*a*
Resin ..	6·2	6·4
Proteid ..	9·5	9·8
Ash ..	1·3	1·3

a Soluble caoutchouc 76·5 per cent. ; insoluble caoutchouc 6·0 per cent.

The rubber was valued at 5s 6d per lb. in London. For comparison with this and the following valuations it may be stated that on the same date fine hard Para from South America was quoted at 5s. 1d. per lb., and plantation Para biscuits at 5s. 3d. to 5s. 9d. per lb. This Ceara rubber is of very good quality, although the percentages of resin and protoid are rather higher. The biscuits varied somewhat in colour, and it would be an advantage if they could be obtained more uniform in this respect.

CASTILLOA RUBBER (*Castilloa elastica*).—Two specimens of this rubber were submitted, one from Kullar and the other from Burliar. The sample from Kullar was labelled as follows :—"No. 2. Castilloa rubber from trees planted in the Government Experimental Garden,

Kullar (1,300 feet), Nilgiris, in April 1902 ; collected June 1908." It weighed 6½ oz., and consisted of a rough sheet of dark brown rubber, containing a fair amount of vegetable impurity. The rubber was rather soft, slightly sticky and weak. A chemical examination gave the following results :—

	Sample as received. Per cent.	Composition of dry rubber. Per cent.
Moisture ..	1·5	—
Caoutchouc ..	62·7	63·6
Resin ..	32·0	32·5
Proteid ..	0·9	0·9
Insoluble matter ..	2·9	3·0
Ash ..	2·29	2·4

The rubber was valued at 3s 2d to 3s 4d per lb. in London. This rubber is of inferior quality, owing to the large percentage of resin present. The trees from which the sample was obtained were, however, only six years old, and it is probable that the quality of the rubber will improve as the trees become elder.

The specimens from Burliar bore the following table :—" No. 3. The Castilloa rubber from the Government Experimental Garden, Burliar (2,400 feet), Nilgiris, February, 1908." It weighed 5¾ oz., and consisted of rough sheets of rubber varying in colour from light to dark brown, and containing traces of vegetable impurity. This rubber was much stronger than the preceding specimen from Kullar. On analysis it give the following figures :—

	Sample as received. Pes cent.	Composition of dry rubber. Per cent.
Moisture ..	0·2	—
Caoutchouc ..	86·1	86.2
Resin ..	12·8	12·9
Proteid ..	0·5	0·5
Ash ..	0·4	0·2

The rubber was valued at 3s 6d to 3s 8d per lb. in London. This sample of Castilloa rubber from Burliar is much superior in composition and physical properties to the specimen from Kullar. No information was furnished regarding the age of the trees from which the rubber was obtained.

Para Rubber (*Hevea brasiliensis*).—Specimens of Para rubber were received from both Kullar and Burliar. The sample from Kullar was labelled as follows :—" No. 4. Para rubber from trees planted in the Government Experimental Garden, Kullar (1,300 feet), Nilgiris, in April, 1902 ; collected June 1908." It weighed 7¾ oz. and consisted of 2 large biscuits of dark brown rubber containing traces of vegetable impurity. The rubber was rather deficient in strength. The results of the chemical examination are given in the following table :—

	Sample as received. Per cent.	Composition of dry rubber. Per cent.
Moisture ..	0·8	—
Caoutchouc ..	92·0	92·8*a*
Resin ..	2·6	2·6
Proteid ..	3·0	3·0
Ash ..	1·6	1·6

a Soluble caoutchouc 88·8 per cent. ; insoluble caoutchouc 4·0 per cent.

The rubber was valued at 5s to 5s 2d per lb. in London. This rubber is very satisfactory in composition, but the biscuits are dark coloured and contain specks of vegetable impurity. The value of the rubber would be enhanced if it were lighter in colour. The specimen of Para rubber from Burliar was labelled as follows :—" No. 5. Para rubber from the Government Experimental Gardens, Burliar (2,400 feet), Nilgiris. Trees planted November, 1898 ; rubber collected November, 1907." It weight 17¼ oz. and consisted of two biscuits and three long narrow strips of rubber, rather uneven in colour, and containing traces of vegetable impurity. The rubber was in good condition and possessed fair strength. It had the following composition :—

	Sample as received. Per cent.	Composition of dry rubber Per cent.
Moisture ..	0·4	—
Caoutchouc ..	91·5	91·9*a*
Resin ..	3·9	3·9
Proteids ..	3·7	3·7
Ash ..	0·5	0·5

a Soluble caoutchouc 90 per cent. ; insoluble caoutchouc 1·9 per cent.

The rubber was valued at 5s 4d to 5s 5d per lb. The sample of Para rubber was much lighter in colour than the preceding specimen, but like the latter it contained minute vegetable fragments which should be removed from the latex by straining. The rubber was very satisfactory in composition.—*Imperial Institute Bulletin.*

CACAO CULTIVATION IN GERMAN COLONIES.

The rapid development of the German Colonies during the last few years is well illustrated by the advances made in agriculture and especially in the cultivation of cotton, sisal hemp, rubber and cocoa. The cultivation of cocoa in the German Colonies has extended with remarkable rapidity.

In the Cameroons, the industry is chiefly in the hands of European companies. Owing to the attacks of a bark-boring beetle, measures were adopted with the object of arresting the damage and good results were achieved. Areas infested with such pests were manured with superphosphate and potassium chloride, with the result that largely increased yields of cocoa were obtained.

The earlier attempts of the natives to grow cocoa resulted in failure owing chiefly to the natural aversion of the people from innovations. Moreover, the Cameroon negro is not so well qualified for agricultural work as is, for example the native of the Gold Coast. The consequence was that the plantations were abandoned and afterwards became choked with weeds. Some improvements has now been brought about by the efforts of the Government officials in instructing the natives, distributing seed and young plants, and directing the operations ; particularly gratifying advances have been made in the Victoria district and in Bodiman. Recently attention has been directed more especially to the exercise of increased care in preparation in order to produce a cocoa of consistently good quality.

In 1907-8, 18,961 acres were under cocoa the number of trees amounting 2,768,351, of which those on 12,532 acres were in bearing. The

crop amounted in 1906 to 1,174 tons and the value of the export to £57,230. In 1907 the crop increased to 1,587, tons and in 1908 was still larger; the exports in the latter year attained the value of £147,000.

The cocoa industry has also made remarkable progress in Togoland, and the natives are taking an increased interest in it. The cultivation is almost entirely confined to the Misahöhe district. Experiments in the Atakpame district have shown definitely that this region is unsuited for cocoa growing. The Government are doing a great deal to foster the industry in the interests of the natives and have distributed seed and young plants. There is

ONLY ONE EUROPEAN UNDERTAKING

engaged in cocoa planting and this has 222 acres under cultivation; the yield from this plantation amounted to 1,951 lb. in 1906, and 6,172 lb. in 1907. The exports of cocoa have increased from year to year as follows:—In 1904 209 cwts. of value £436 16s; in 1905, 258 cwts. of value £475 18s; in 1906, 564 cwts. of value £1,078 16s; and in 1907, 1,028 cwts. of value £2,496 9s.

The cultivation in Samoa is extending from year to year and is in a very promising condition. In 1907-8, 3,508 acres were under cocoa; 684,032 trees were growing, of which 280,990 were in bearing. Although unfavourable weather was experienced in the autumn of 1907, the exports nevertheless rose from 90 to 117 tons. The exports for 1908 were expected to show a still further increase. The cocoa trees have hitherto been free from disease and appear strong and healthy. The planting companies consider that an average yield of 450 lb per acre can be obtained from the older plantations. Both the "Criollo" and "Forastero" trees have proved satisfactory.

Since the cocoa industry demands special agricultural work for which the natives of Samoa are not well fitted, it has been considered necessary to have recourse to imported labour; in January 1908 more than 1,000 Chinese coolies were employed on the plantations. The Chinese work, on the whole, well and carefully and are skilled in the finer branches of agriculture such as are involved in cocoa cultivation. Unfortunately, however, the coolies who have hitherto reached Samoa are not of the best type but it is hoped that a better class will be forthcoming. Owing to complaints which have appeared in the Chinese newspapers, the Chinese Goverment have been urged to prohibit the exportation and a

CHINESE COMMISSIONER HAS BEEN SENT

to Samoa to inquire into the labour conditions.

In German New Guinea the cocoa industry is still in its infancy. In the year 1907-8, 404 acres were under cultivation. The plantations contained 78,945 trees, of which only 2,975 were then in bearing. The exports in 1907-8 amounted to 1,025 lb. There are many difficulties to be overcome, such as the occurrence and spread of the deep-rooted and tenacious alang-alang grass and the attack of insect pests. In spite of these draw-backs, however, vigorous efforts are being made to establish the industry securely.—*Imperial Institute Bulletin.*

COCONUTS IN JAMAICA.

The following report has been made to the Director of Agriculture, date 28th June, 1909:—

I have carefully examined the coconut trees on the coast of Portland, and there would appear to be little disease in the western part of the parish, the disease or diseases increasing as one goes east. The troubles most prevalent are

"SHRIVELLED TOP," "BUD ROT" AND "WEEVILS."

These must be kept distinct from troubles caused by trees being planted in unsuitable land or situations, lack of cultivation, stifled by climbing weeds, etc. The situation is practically identical with that in the western end of Jamica in 1900; the remedy will have to be the same. The first thing is cleanliness, the second thing is cloanliuess. "Shrivelled top" may be microbic or fungoid, but that want of air and excessive moisture helps to spread the disease there is no doubt whatever. There is also no doubt that the disease sproads from one tree to another or to many others, and carelessness in leaving one diseased tree untreated, means the death of many others. "Bud rot," too, is as yet undetermined, but the fact that it is a disease very liable to sproad from one tree to another if steps are not taken to prevent it, is equally well established. The symptoms of "weevils" attacking trees are so easy to discover that the most unobservant can easily note the reddish "water" running from the stems of the trees, and be ready to put the preventive measures in force at ouce. The watchword in dealing with all the troubles should be prevention. Any trees observed to be below par, not "cleaning," *i.e.*, the dead leaves sticking on to the trees instead of dropping clean off, should be "signed," *i.e.*, fire set to the "strainer" on a nice, dry day, which has the effect of causing the dead leaves to fall clean off, destroying dead strainer and allowing the chief enemies of diseaso, sun and air, to have access to the stems of the trees and do their share of the preventive work. Care should be taken to

PREVENT CLIMBING WEEDS OF ALL KINDS

from infesting the trees. This would appoar to be at prosent the only really practical method of dealing with both "shrivelled top" and bud-rot. It is not advocated as a cure for bud-rod, but a preventive measure. In the early stages of "shrivelled top," it would appear to be a cure, as it certainly is a sure preventive. The great thing is not to wait for symptoms, but immediately there is a tree seen to be unthrifty to treat it with fire; many of these unthrifty trees drag along for years giving no returns, finally developing some diseaso which they spread to other and profitable trees; cleansing with fire at any rate prevents this. Cloanliuess in a coconut walk is the surest preventive of the spread of diseases. Destruction by "weevils" has not as yet assumed serious proportions, but it is on the increase, and the ignorance in dealing with it is demonstrated in this parish, as I have lately observed trees being signed at the top as a cure for borers at the bottom.

On first observing signs of borers, *i.e.*, the reddish "water" running from the stems, apply to the stems of the trees a good coating of tar

from the ground to a height of three or four feet above the highest sign of the work of the borers. Keep the trees under observation and should any sign of activity on the part of the borers be observed, give the tree a second coating of tar. This is a sure cure, usually one tarring is sufficient to stifle the borers, but occasionally two are required.

A MINOR TROUBLE

which has been observed in Portland, has been described in the *Bulletin* of the Botanical department, 1901, page 104. The nuts in this case are affected, developing husk only and no meat. In some cases, an odd nut or two on a tree is affected in this way, while in some cases trees produce nothing but the split nuts. The authorities of the New York Botanical Gardens reported "that no trace of fungus, insect or bacterial activity could be found and that the trouble was probably due to defective fertilization," but I have sprayed trees affected in this way with Bordeaux Mixture after which they have ceased to produce these worthless nuts. At Thompson Town, in Clarendon, a tree was treated which, I was assured, had never produced anything but meatless nuts although the tree must have been over 60 years old. The following year I had the pleasure of drinking water coconuts off that tree.—W. CRADWICK, Instructor.—*Journal of the Jamaica Agricultural Society* for July.

CO-OPERATION IN AGRICULTURE.

"Small Holders—What they must do to succeed" is the title of new work by Edwin Pratt, author of the well-known work, "Organisation in Agriculture," and published by King and Son, at 2s. As Pratt has shown in his previous work, the principle of co-operation is the pivot upon which the success of modern agricultural methods rests, and the advantages of the system cannot be preached too often. We have just now a Commission deliberating on a scheme for loans to agriculturists. It is a very representative body made up of administrative officers, financial and legal advisers, headmen and actual cultivators, and we have hopes of some practical measures being evolved from their labours. The problem they have to solve is a difficult one, and particularly so in an Eastern country; but it has, to a great extent, found a solution in India, and there appears no reason why the same lines should not come to be adopted in Ceylon. The foundation of any scheme for agricultural loans is, of course, co-operative credit, which is one of the subjects that Pratt so ably deals with in his works. The two main types of co-operative credit banks are those named after the founders, the Schulze-Delitzch and the Raiffeisen. The latter is without doubt the more far-reaching in its moral influence in that the individual who has not the confidence of his neighbours would have no chance of participating in its benefits. Another excellent rule which it embodies is that loans are only granted for reproductive purposes, which offer a reasonable guarantee that the position of the borrower will be improved and that he will be able to repay the amount advanced to him. There will thus be little opportunity (as Dr. Willis feared) for Sinhalese villagers raising loans to be devoted to the expenses connected with weddings and funerals! The essence of this system of banking has been well described as the capitalisation of honesty, and we would commend the system to the members of the local Commission, since it gives a market value to personal character.

It is only by organising such measures for ameliorating the condition of the rural population—rescuing them from debt and placing them on a firm financial footing, improving their food supply and sanitary conditions, and generally advancing their material and moral welfare—that we can ever hope to bring about what Pratt calls the "revival of country life," and stem the tide that flows from the country to the town.

In a paper read before the British Association in Dublin last year Sir Horace Plunkett declared his strong conviction that the education of the rural classes must be modified so as to interest them in their surroundings and make their environments more attractive to them. Pratt, himself, says that what is wanted is an education which has a direct bearing on the future requirements of those taught. The old system is calculated to tax the memory and weary the brain, without developing initiative and awakening observation. This matter of the education of village youth is also, we are glad to say, receiving due attention, since a Commission appointed by H. E. the Governor has for some time been sitting with a view to elaborate a workable scheme for the advancement of the native agriculturist whose present condition is as unsatisfactory as it could well be. We would commend the reading of Pratt's volume to all interested in the welfare of the rural classes, as it is full of information regarding the principles which should govern any measures calculated to improve the status of the small holder.

SINGLE PLANTING OF PADDY.

ITS ADVANTAGES.

The following note by Mr H C Sampson, Deputy Director of Agriculture, Southern Circle, has been sent to us for publication by Mr M E Couchman, I C S, Director of Agriculture:—

For some time the Agricultural Department has been advising ryots to adopt the system of planting paddy with single seedlings. In the Kistna Delta this is, and has always been, the ordinary practice, and few better paddy crops are to be seen in the Presidency. Single seedling planting has also gained a footing both in Tinnevelly and in the Tanjore Delta, and in both these Districts some thousands of acres are now planted in this way.

Ten varieties of paddy, which are cultivated in the south of the Presidency, in the *samba* and *pisamun* season, were last season grown by planting with single seedlings. With the exception of the *Jeenaka samba* (a very fine paddy which makes up for its low yield by the excellence of its grain) all have yielded better than

the local *samba* grown by ryots, in the ordinary way, but with similar manuring, yielding, on an average for nine varieties, half as much again as was obtained by ryots in the locality. This, however, is not the end of single seedling planting. It is found that seed saved from a singly planted crop is much

SUPERIOR TO SEED SAVED FROM A CROP PLANTED IN BUNCHES OF SEVERAL SEEDLINGS.

The reason for this is not far to look. When a single plant of paddy is planted, it is given all the space, soil and manure which usually go to from 15 to 20 seedlings when planted in bunches; it can easily be understood that such a plant is more robust and therefore can fill the grain which it forms much better than any of the 15 to 20 plants which have to struggle for existence one against another. Not only is this the case, but the seedlings raised from seed obtained from such a plant tend to reproduce the peculiarities of its parent, and if such a parent plant tillers well, the next generation tends to dovelop an increased power of tillering and consequently to give a greater yield. This has to some extent already been proved at the Palur Agricultural Station. In 1907-08, *Garudan samba*, planted on 16 different plots, gave an average yield per acre of 1,952 lb; in 1908-09, the same plots, planted and manured in the same way, gave an average yield of 2,264 lb; only in this latter case seed had been specially selected from those plots which had been planted with single seedlings. Hence the increase per acre of 312 lb. can only be put down to the improved seed, as all other conditions were practically identical.

Very few experiments have been made with any of the *kar* varieties of paddy except on the West Coast, where the varieties of paddy which were tested at first showed hardly any powers of tillering. These have now been tested three years, and the last two years the seed has been specially set apart from crops which had been transplanted with single seedlings. In the first year each plant had only one or, occasionally, two shoots. In the second year many of the plants had three shoots. In the third year nearly all the plants had three shoots and some as many as five. Thus at present crops planted with three or four of such seedlings in a bunch give better yields than singly planted crops but, as the tillering power develops, gradually the singly planted crops, though even now much superior to the ordinary locally planted crops, are overtaking in yield those planted with three to four seedlings. To plant paddy with singlo seedlings it is necessary

NOT TO SOW TOO MUCH SEED IN THE SEED-BED.

To plant one acre, a seed-bed of seven cents sown with seven Madras measures of paddy, is ample. If possible *puttidainathu* should be adopted in preference to *sittirainathu*. Tho seed bed should also be manured with well-rooted cattle manure and ashes, so as to give the seedlings a good start. The seedlings should not be too old when transplanted ; seven days for every month of the crop may bo allowed. Thus, for a five month crop the seedlings should be not more than 35 days old,

Some difficulty may at first be experienced in getting the transplanting coolios to transplant single seedlings. Therefore, until they get into the way of it, close supervision is necessary. If, however, the seed-beds are grown as above described, the seedlings are themselves sturdy and are easily separated one from the other, and not so much difficulty will be felt. As regards the distance apart at which seedlings should be transplanted, the ryot should use his own judgment. On land which produces over 1,000 Madras measures per acre a span apart, on land which produces 750 Madras measures per acre three-fourths of a span, and on land which produces 500 Madras measures or less half span will probably be the best distances. Occasionally on very rich land, which may normally yield 1,500 Madras measures of paddy, even as much as two span distance between the seedlings may give better results, while on very poor land the cost of single planting may be prohibitive. Further than this the Department is unable to advise, as so much depends on the variety of paddy, the quality of the seedlings, and whether the seed has been selected from singly planted crops or not.—*M. Mail*, Sept. 27.

(To the Editor "Madras Mail.")

SIR,—In the note written by Mr H C Sampson on "Single planting of paddy," published in your issue of the 27th instant, I find one or two words which are not clearly understood. The word *Jeenaka Samba* occurring in the beginning of the second paragraph is a clerical error for *Jeeraka Samba*. In para. 4 there is a sentence as below:—"If possible *pullidai nathu* should be adopted in preference to *sithirai nathu*." The words *pullidai* and *sithirai* are not clearly understood. I believe that they are meant to refer respectively to the "dry" and "wet" system of sowing seed in the nursery. If so, the correct words would be *puzhudi nathu* and *setru nathu*. In the concluding portion of his note, Mr Sampson states that "on very poor land the cost of single planting may be prohibitive." It has been understood that the cost of planting single seedlings is usually less than that of planting in bunches. I believe that it is meant that single planting in very poor soils may not be profitable. It would have been perhaps better if the sentence had been worded more carefully, because there are some persons who assert the cost of planting single seedlings is in excess of the cost of ordinary planting, while such is not actually the case.

T. DHARMARANGA RAJU.

—Ibid, Sept. 29.

EXPERIMENTAL CULTIVATION OF "CARVONICA" COTTON.

A FAILURE IN EGYPT (SUDAN).

With reference to the notice on p. 234 of the *Board of Trade Journal* of 30th July, 1908, relative to experiments in the cultivation of "Caravonica" cotton in the Sudan, the Sudan Agent at Cairo writes that during the last twelve months it was decided to discontinue these experiments. The growth of the plants was not satisfactory, and the yield did not compare favourably with that from Egyptian cotton. —*Board of Trade Journal*, Sept. 16.

RUBBER AND TOBACCO IN SUMATRA.

ENCOURAGING VIEWS OF A GERMAN PLANTING EXPERT.

Mr. Sandmann, the German planting expert whose arrival in this part of the world in the interests of rubber-cultivation we noticed the other day [and who is now in Ceylon.—ED. *C.O.*] has visited Deli where he was interviewed by a representative of the Sumatara Post. He has travelled extensively in the tropics, and has taken up rubber as speciality. He spoke highly of rubber prospects in Deli, especially as regards the Hevean kind. The trees he saw there appeared to be in no way inferior to those of the same age which he had seen in other lands. As rubber has only just been taken up in Deli, nothing could be forecasted as to the probable yield. In his opinion, high quality rubber best suits the market in sheets and blocks.

Mr. Sandmann then spoke of tobacco growing in Deli, and compared it with what he had seen in that line elsewhere. He had nothing but admiration for what planters had done in the Colony. In his opinion, nowhere else in the world is tobacco grown with such care and grasp of scientific principles. Planters had no need to be alarmed at the efforts made in the United States to grow an article equal to Deli leaf, judging from what he had seen of shade tobacco cultivation there. Experience shows that Deli tobacco planted elsewhere soon degenerated. Deli planters have besides the advantage in trained and cheap labour.–*Straits Times*, Sept. 15.

TOBACCO IN NYASALAND: REPORT BY MR. STEWART McCALL.

We learn from the above report dated Zomba, Nyasaland, 31st July, to hand today, that the tobacco industry is now permanently established in Nyasaland, and increasing in importance yearly. Six years ago, little was cultivated by Europeans in the Protectorate. The establishing of the Imperial Tobacco Company's Factory at Limbe near Blantyre has given considerable incentive to production; the acreage under the crop has risen rapidly. In 1905, 421 acres were under cultivation, and this year 2,368 acres. The local prices range from 2½d. to 9d. per lb., and the return varies between 400 and 600 lb. cured tobacco per acre. The experts attached to the Factory are satisfied with the product, their chief complaint being shortage of supply. In the Shire Highlands there are large areas of suitable land. The area of tobacco which can be successfully cultivated by a planter is much less than of cotton or coffee, but a planter can grow cotton and coffee on the same estate as tobacco. 200 acres is a maximum with, tobacco, 600 to 1,000 of cotton can be superintended by one planter, with less work. There is a splendid opening for energetic tobacco growers in the Protectorate, Mr. Stewart McCall says. The report of the Director of the Imperial Institute on tobaccos from Nyasaland says that five samples were received. All burnt fairly well and gave off a smoke of pleasant aroma, which, however, differs slightly from that of American tobaccos (of similar types, and recalls to a certain extent the aroma characteristic of South African tobaccos (so-called "Boer" tobaccos). The results show that on the whole these tobaccos are of satisfactory composition. The percentage of moisture is somewhat low, but this is inevitable in small samples transported without special precautions. The percentage of nicotine is in all three cases noticeably small and lower than the average found in American tobaccos of similar type. The total nitrogen is also satisfactorily low. The results of the ash analyses of these Nyasaland tobaccos show that they are all moderately high in potash and low in those constituents which exert a deleterious action. They seem to have been grown on soils deficient in nitrogen, and as regards Nos. 3 and 12 on soils also deficient in soluble mineral constituents. Samples of the five tobaccos were submitted to two firms of tobacco-manufacturers for commercial valuation. The first firm reported that the tobaccos, so far as appearance went, compared favourably with similar types of American tobaccos, but that the flavour was different and this would lower the commercial value, unless the flavour proved on trial to be popular. The second firm valued the samples: No. 1 at 9d. per lb., No. 2 at 9d. per lb., No. 3 at 7d. per lb., No. 4 at 5d. per lb., and No. 12 at 6d. per lb.

WASHES FOR CACAO THRIPS.

The annual report on the Experiment Plots, St. Lucia, for 1908-9, describes experiments with different washes for the purpose of determining their efficiency in controlling thrips on cacao trees. The trials were conduced with those described in the *West Indian Bulletin*, Vol. IX, pp. 19-2, which are (1) resin wash, (2) kerosene emulsion, (3) emulsion with whale-oil soap, (4) resin and whale-oil soap compound. It is stated that each of these was more or less effective in destroying thrips, but that the resin wash appeared to do the best work, on account of its property of sticking firmly to any surface with which it may come into contact. 'More of this mixture adhered to the leaves than in the case of the other washes, and dead thrips were observed in greater numbers on trees treated with it. Some care is necessary, however, in applying this wash, as the trees treated with it dropped their leaves within a few weeks of being sprayed. This circumstance was probably due to the fact that it contains caustic soda.—*Barbados Agricultural News*, Sept. 4.

CACAO IN LA GUAIRA.

Cocoa (says Mr. Vice-Consul Brewer) continues to be the principal article of commerce of La Guaira. When the cocoa crop fails all the trade of La Guaira suffers. This is only natural, as the exchange of commodities takes place entirely with the district on the coast to the eastward, within a distance of some 200 miles, where the cocoa is principally grown. The cocoa is sent to commission agents here for sale, as well as for its preparation for export, and this traffic and the work of cleaning, sorting and shipping the article form a considerable part of the commercial activity of the port. —*Financier*, Sept. 23.

PLANTING NOTES FROM PORTUGUESE WEST AFRICA.

BY LIEUT.-COL. J. A. WYLLIE, F.R.G.S.

(*Concluded from page 376, October issue.*)

Portuguese W. Africa Enemies of Cacao.

III.

St. Thomé, Portuguese West Africa, 1st August, 1909.

ENEMIES OF CACAO.

DEAR SIR,—My letter of the 28th ultimo will have given you some idea of the difficulties the cacao planter has to contend with. To return to the cacao plant, it, too, has its enemies, in S. Thomé as elsewhere. A goat is a goat all the world over, and in S. Thomé he is just as fond of the leaves and young capsules of cacao as in Ceylon. But being too useful to mankind to be dispensed with, on the plantations he is rigorously confined to the barrack square, where he is fed on the grass and leaves, brought in as fodder for the cattle and mules of the estate by the weeders at the close of their day's work. In the centre and south of the island of S. Thomé, apes are so troublesome that some proprietors keep up a small corps of "chasseurs d'Afrique" to make war against them. These animals pluck the capsules from the trees, break them with their teeth, suck the pulp from the seeds, and throw the latter down on the ground. They do not confine themselves to cacao. A planter told me that, some years ago, when engaged in laying out

A RUBBER PLANTATION,

he was puzzled to account for the peculiar from of mischief being daily worked upon his seedlings, particularly those of Ceará rubber. Setting himself to watch, he soon discovered the author of the play. A monkey would deliberately take stock of the seedlings planted out, begin upon a row, pull up a plant, examine it, sniff at the tuberous roots, perhaps try his teeth on them, then fling the plant down, with a grimace of disgust too comical for words, and pass on to the next, and the next, testing and rejecting each in the same systematic fashion. That planter is now sorry he interfered with the monkey's beneficent task, for the islands are overrun with Manihot as a weed, and it is a remarkable fact that about fifty per cent. of the mature trees contain little or no latex.

Rats and mice are still more troublesome, especially in the fermenting floors. But as they, like the monkeys, content themselves with the pulp of the bean, a certain proportion of the cacao nibbled at by them is recoverable, but when cleaned can only be shipped separately from the rest as a lower-grade bean. War is waged against them by means of fox-terriers, a dog that stands the climate better than any other. Snakes are very rare in the islands, and the planters might do worse than import a few pairs of the harmless Indian ratsnake to aid in the campaign.

WHITE-ANTS, LOCALLY KNOWN AS *salalé*,

are found, but not in anything like the numbers or destructiveness of their Indian and Malayan congeners. One species (termes theobroma) has been classified as devoting itself to the bark and dead wood of the cacao tree, while another (a Calotermes), confines its attention, as in the F.M.S., to the heartwood of the living tree; with this curious difference, however, that while in the latter country it works from the tap-root upwards, bringing the tree down bodily with all its leaves green and healthy, in S. Thomé it works from the crown downwards, killing the foliage branches down to about four or five feet from the ground, when the upper-half of the tree comes down with a crash. The planter can generally save the tree by sawing off the dead portion horizontally and tarring the surface of the cut, leaving the plant to re-form by means of stool shoots, which it readily does. This method of heavy pruning is also adopted to rejuvenate a tree shewing signs of age in the diminution of its crop, and is generally successful.

A vegetable parasite attacking the fruit has, for some time past, been causing anxiety to the more thoughtful of the proprietors—so much so that the Colonial Ministry at Lisbon has deputed two agronomists to the islands to study its nature and *modus operandi*. It is suspected that more than one parasite must be held responsible—a *phytophthora* causing the soft black rot of the capsule and a *botryodiplodia* following it up with a kind of dry rot of the bean. But as the specialists have not completed their observations, it is premature to speculate as to the remedy.

A CURIOUS BUT VERY EXCEPTIONAL CONDITION,

supposed to be due to bacterial agency, has been pointed out to me. The tree is normal and healthy in all respects except that its stem and branches are dotted over with buds or excrescences of varying shape and size. It bears abundant flowers all the year round, but never produces a single fruit. The Portuguese call it *cacau macho* or male cacao—a misnomer, of course, as the flowers display the characteristics of both sexes—and regard it as a freak of no agricultural importance, interesting mainly for its rarity.

In S. Thomé as in our own Eastern possessions, cacao is capricious in its yield. Two crops are gathered in the year, the Christmas one being double or treble that of midsummer. At four years of age, Chevalier records that the tree may be reckoned upon as good for 6 capsules of marketable bean, the annual yield rising to 45 in the tenth year, 50 or 60 in the twelfth, the final figure representing from 1,200 to 1,500 kilos of cacao per hectare. As exceptional yields, 200, 300, and even 400 fruits have been recorded from single trees in a single year, but M. Théo Masui, a Belgian authority on tropical agriculture, who visited S. Thomé in 1900, estimates the average annual production at from 600 to 700 kilos per hectare cultivated. Official

STATISTICS OF THE AREA

actually under cacao, and of the total annual crop, do not exist. Mr Monteiro de Mendonça has, however, placed his notes at my disposal as regards the latter point. These show the total average crop of the islands in recent years to be

about 24,500 metric tons, of which Principo contributes about 1,500 tons, S. Thomé yielding the rest. At £50 per metric ton, the value of the output would work out to £1,225,000, and at 650 kilos per hectare, the area under cultivation may be approximately estimated as 796,250 hectares, or over 190,000 acres (say 300 square miles).

THE HARVESTING

of the crop is done as follows:—the capsules as gathered are broken on the spot, and the beans with the pulp still on them are loaded into wagons running on the Decauville lines of trolly-railway forming a net-work of communication on every property of importance, the husks being left in heaps to rot and furnish manure for fresh pits to be dug to supply blanks in the plantation. As the wagons get filled they are coupled up into trains and sent in by mule traction, or, if the slope permits of it, run down by their own velocity (restrained by a brake), to the nearest *dependencia* (a barrack yard of cooly lines and stores under control of a resident European assistant, of whom each important property has a staff of from 20 to 50 including artisans. There they are either left in the wagons to ferment, or, if the season is a busy one, transhipped to a special train of fermentation bins on trollies, leaving the wagon free for further work. In either case the wagons or bin is closed by a tight-fitting lid, care being taken that the beans are not crushed thereby. The

FERMENTATION

process is quicker in wet weather, slower in dry, varying from two to six days, and also, I think, regulated in duration according to the experience and practice of the various managers. In the small native properties, the owners of which do a minimum of cultivation and supplement their own scanty crop by thefts or illicit purchase from the hands working on the large estates, the beans are shot into any convenient receptacle, the favourite being an unserviceable canoe, and covered with banana leaves till fermentation is complete. The Venezuelan or West Indian processes such as *terrage*, the polishing of the bean under foot, and washing are not in use, the bean after fermentation being simply dried in the sun upon rolling platforms so constructed as to be run under cover on the first warning of a shower. Naturally, this important operation has to be conducted under European control, and in the best-planned *rogas* the drying platforms are in full view of the *administrador's* bungalow, from the upstairs verandah of which, when resting or doing his office work, the chief can keep an eye on his subordinate and see that his gang are being adequately supervised. In the Boa Entruda plantations and in those of the Marquez de Valle Flor adjoining them, the platforms are arranged in eight rows of five each, forming four tiers one above the other, making 160 platforms in all, each little train of five running on its own line of rails so that it can at a touch be moved into or out of cover independently of all the rest.

From the time when the fermentation bins are first opened, to the end of the process, a

CHARACTERISTIC VINOUS ODOUR,

not disagreeable, pervades the house and barrack yards, making itself felt to a considerable distance around. It is a generally recognised experience that a smell, be it pleasant or the reverse, is one of the most powerful associations in aid of memory. Speaking personally, were it possible for one knowing the place in former years to be suddenly dropped from the clouds into Madras, Hyderabad, Malta or Port Said, and let me now add S. Thomé to the list, one might almost find one's bearings by the recognition of the prevailing odour. The fermenting bean smells not unlike the must of the grape spilt about on the vineyards of Torres Vedras or the Douro, but with a quite perceptible difference.

When the climate is too persistently damp to allow of complete drying in the sun (and this is the case in most parts of the islands) artificial heat is resorted to. But it is unsatisfactory, the machinery generally roasting the bean instead of drying it. It is generally agreed that good

BRITISH MACHINERY WOULD SOLVE THE PROBLEM.

But it is the old story over again. The Yankee or German commercial traveller, on the spot, or due to arrive at known intervals, is, as a rule, a genial companionable fellow, with a fluent command of the language, ready to promise anything his clients may reasonably want by way of modification or adaptation of the standard type of machine (and to do him justice he takes pains to carry out their suggestions); while Great Britain is only represented by a catalogue or two, brought to the island by the German trader himself (for the latter's samples are quite impartial as to nationality of origin !), and printed as often as not in English—a language unfamiliar to most of the proprietors or *administradors*—with weights and measures that even an Englishman has difficulty in using for his own purposes, let alone interpreting in metric figures for his neighbours. I have, it must be admitted, seen catalogues of English engineering firms, written in good Portuguese, with metrical and Britannic figures of weights and dimensions appended to each diagram, and a general invitation to the public to regard the diagram as a type capable of variation to suit each case. But

NO CATALOGUE CAN SPEAK AS A COMMERCIAL TRAVELLER CAN,

and in a land where much noisy talk is the soul of business, no Portuguese colonist will trouble to embark on a correspondence in a foreign language so long as he has a man to talk to who will sell him rubbish and stand any amount of chaff as to its inferiority without losing his temper or assuming the "take it or leave it" attitude generally ascribed to the Briton. Perhaps this class of business is not worth cultivating; not being a manufacturer I cannot say; but as an outsider it strikes me that more intimate relations between our large engineering houses and the cacao planters of these islands would be an excellent thing for both, in more directions than one.

I pass over the final stages of preparation of the bean for the market, its transport by private rail to the jetty of the plantation, whence it is carried by launch to the vessel of the Empreza Nacional—the rich Portuguese Shipping Company holding the practical monopoly of the colony's carrying trade—and its subsequent disposal in Europe. These are matters outside the scope of my notes.

As to the other products of the islands,

COFFEE

is at present the second in point of importance, but erelong rubber will take precedence of it. Before cacao proved the gold mine that for the past ten years or so it has been, attention was given to the experimental cultivation of various caoutchouc-yielding plants. But the colony unfortunately had not a Wright, a Carruthers, a Proudlock to advise them, and consequently the more or less worthless manihot was encouraged to spread itself weed-like over both islands, to the discredit of the less aggressive species. Cacao then absorbed all their available energies until the humanitarian campaign against that product, the threatened blight on the capsules, and the warnings of writers such as Chevalier and Almada Negreiros as to the dangers of a monoculture, combined to stimulate a taking stock of their resources and position. Hence, partly, their invitation to me to visit S. Thomé and

EXAMINE ITS RUBBER RESOURCES IN THE LIGHT OF RECENT RANGOON EXPERIENCES.

What I found, and the significance of it, are naturally matters primarily interesting the planters who invited me, but I do not think I am giving away any secret by mentioning that whether the boycott of S. Thomé cacao continues or not, a year or two hence these islands may figure as a regular and recognised source of plantation rubber—Rambong and Castilloa chiefly, Pará being quite up to Eastern standards in quality if not yet in quantity. The market for S. Thomé rubber will presumably be beyond the range of boycott, as is now the case with its coffee, and it will be interesting to see what direction, if any, the campaign will then take.

Just a word or two as to the

DAILY LIFE ON THE PLANTATIONS.

The morning bell calls the serviçals (negro labourers) to work at 6 a.m., when the European manager and those of his assistants who reside at headquarters turn out, if they are not already on the ground, muster the men and women, set them their tasks, and start the work of the plantations for the day. Similarly at the *dependencias* or outposts. The muster is a curious sight. The men turn out in striped blankets, or in cast-off English uniforms. I noted several jackets of the Essex Regiment on one roça, and others of British infantry regiments not distinguishable, but the favourite garb was a substantial kind of black frock coat, labelled on the collar "Ticket Collector, M. R." (presumably cast-off clothing of the Midland Railway.) The wearers were Moçambiques who told me their garments had been served out to them at Quilimane for the voyage to S. Thomé, and they still wore them on the chilly mornings and evenings on the plantations. The women, whose children are still being nursed, take them out with them to work, each mother placing her child astride behind her, its face looking up her spine, and bandaging it to her body by means of a cloth passed round the bodies of both and tied in front of the mother. The children of from one to ten or twelve years of age are left in the barrack square, a crèche being provided for them and an old woman told off to look after them. But practically they go where they like within the enclosure, scrambling over the heaps of cacao, sailing boats in the duck pond, and occasionally invading the administrator's bungalow, where they are received good humouredly and given chocolates ("slave cocoa") by the ladies of the family, then sent off to play outside. The

PORTUGUESE UNDERSTAND BETTER THAN ANY OTHER EUROPEAN NATION HOW TO MANAGE BLACK PEOPLE,

and it is an eye-opener to any European stranger, knowing the stand off relations between white folk and coloured in other parts of the world, to visit a St. Thomé roça and see how the band of little niggers, who have never set eyes on him before, will come up and chatter to him, taking his hand in their little black paws and leading him about with the perfect confidence and ease of, say, a well-bred French child—as free from shyness as from impertinence. One can hardly conceive a more practical disproof of the charges of cruelty and brutality so recklessly brought against the S. Thomé planters, and brought by men who have had the opportunity of seeing things as they are.

Tho muster over and the work of the day begun, the *mata bicho* or meal corresponding to the Indian chota hazri is sent out to the workers, the Europeans adjourning to the bungalow for theirs. I say *corresponding*, but with a difference. To an old Indian, accustomed to tea and toast plus bananas brought to his bedside when he awakes, the long wait of anything from one to two-and-a-half hours in tho damp sunless air of a West African morning is a bit trying at first, and the meal itself—salt cod well soused in oil, with red wine to wash it down—is strangely unlike what one naturally inclines to. However, every roça has its own baker, and hot rolls and excellent coffee make amends for the first part of the programme. S. Thomé possesses a quaint fruit known as *safú* (canarium edule), eaten, boiled, with salt, which tastes not unlike asparagus and like the durian of Burma is said (once you acquire the taste for it) to drag you irresistibly back to the island wheresoever you may wander. This fruit generally closes the meal, with a wafer of quinine put on the table as a matter of course with the pepper and the mustard. *Apropos* of

QUININE, IT IS CURIOUS HOW DOCTORS DIFFER.

The doctor of one roça where I was staying entertained us by denouncing the practice of taking a daily dose as a pernicious vice. The system, he said, got accustomed to the drug, but as five grains a day went nowhere in the gallons of blood in circulation, sooner or later the fever of the island got a footing in spite of it, and then the dose had to be increased to one dangerous to give in Africa, where an overdose almost invariably produced hæmaturia. The practical planter, our host, would have none of this heresy. "Mere doctors' talk," said he. "Just another way of saying that you invite the fever to come and put up with you. Wait till he comes, and then send a friendly message to the doctor to come and join the party!" What did I think? I could only beg to be excused from expressing an opinion till I had

tried both ways, but put it to the planter who maintained that it was only a doctor's dodge for securing patients at £10 a visit (fees are high in S. Thomé); that seeing that so much cinchona was grown up above there, it might be a good plan if the doctor and the planter could join hands and set up a facture for the supply of quinine for local consumption instead of sending to London or Paris for it. "My dear fellow," said my friend, "a purely globe-trotting vision! I can assure you that were it possible, I'd get my breakfast and dinner from Lisbon ready cooked, and score on the transaction after paying freight and duty; such is the cost of service here." Anything like an industrial enterprise in S. Thomé is simply impossible under existing conditions."

After the *mata-bichs*—literally *kill-the-worm* (a quaint Moorish idea, of which readers of the Bagh-ó-Bahar will recall a variant in one of that classical series of tales) the whole forenoon is available for work, differing according to the season. The midday meal generally brings with it a certain number of visitors, who spend the day and not infrequently stay overnight. Roças having a reputation for healthiness, if accessible from the city, are generally prepared for an invasion of week-enders, whom their hosts receive with the traditional Portuguese hospitality. One old lady whose roça stands high and airy, about 12 miles out, makes it her aim in life to seek out and invite up to her place anyone she hears of as having been down with fever—to come up and stay indefinitely to recruit. When I called there, I found quite half-a-dozen convalescents, all as merry as sand boys, and well on the way to recovery.

In my next, which must be my last, I will tell you something about the life of the poorer Europeans and of the natives of the island, but space forbids my touching on their case today.—

IV.

Lisbon, August 15th, 1909.

Dear Sir,—Considerations of time and space compelled me to end my last letter to you, that of 30th ultimo, in the middle of a description of life on the *roças* of the islands. There is nothing very exceptional in the routine of the coloured folk's work. It goes on according to season on much the same lines as in our own tropical possessions in Asia, the negro being just as listless and apathetic in his manner of doing things as the Tamil or Koringi cooly. To the British philanthropist (especially to him of the labour delegate type) the eleven hours' working day on the plantations is a thing of horror. India has heard his shrieks on the subject of the Bombay native mill-hand and his or her working hours. But it is hardly necessary to remind a circle of tropical colonial readers that everything in such cases depends upon the pace. Whatever the Bombay cotton miller may do in the way of driving, no one who knows

will accuse him of acting on the rule that time is money. *Festina lente* might well be taken as the motto of the whole Iberian peninsula, and the planter of S. Thomé knows the negro too well to hustle him, he himself having no inclination that way.

If, indeed, our well-meaning compatriots must meddle with the colonies of Portugal to the neglect of their own (to the fervent gratitude of the latter), let them leave the pampered black alone and turn to the case of the poor European in S. Thomé—the immigrant employed, or waiting for a job, on the *roças*. I have over and over again been asked by men of this class whether they had anything to hope from the powerful philanthropy of England. But bearing in mind the history of similar hard cases in Great Britain itself—the Staffordshire pottery worker, the toiler in various sweated industries, and the rest, I declined to hold out any prospect of relief from that quarter. British philanthropy, through much ingenious distortion of fact, and a radical incapacity for putting the saddle on the right horse, seems to have firmly convinced itself that the white man in S. Thomé is a brutal slave-driver, deserving of no compassion. As well might the Indian civilian, assailed by the Indian anarchist, lay claim to the sympathy of Paget M.P. His skin is of the wrong colour. All the same, the life of the solitary European in charge of a *dependencia*, be he a peasant from the remoter provinces of Portugal, a clerk or artizan from one of the cities, or a graduate from Coimbra in search of a short cut to success, is not an enviable one. The nature of his duties cuts him off from the fellowship of his kind.

THE *administrador* (MANAGING DIRECTOR),

with the ladies of his family, and the numerous visitors to the *roça*, stay for the most part at the headquarters bungalow, which, according to the sizo and plan of the estate, may be at any distance from four to fourteen kilometres from his post. Communication is, therefore, restricted, and most business is transacted through the telephone. An occasional party of visitors, personally conducted by the Manager or a headquarters Assistant, may, once in a way, pass through the subordinate's outpost, and may or may not stop for a five minutes' chat if the subordinate is not absent at some remote corner of his charge. But anyone, who has been similarly circumstanced (and most of us tropical agriculturists have been) need not be told how such flashes of light serve but to make the outer darkness visible. Add to this, in certain portions of the islands at least, and especially in the rainy season, serious difficulties as regards food supply, public communications being very imperfect, owing to the high cost of labour.

But if the life of the employed European Portuguese is a hard one, that of the unemployed (including often the unemployable) immigrant is tenfold worse, and would be intolerable were it not for the generous hospitality extended to him by his countrymen, often but little better off themselves in the town of S. Thomé. Even the hotel-keepers receive him on credit (raising their prices proportionately, it is said, in the case of distinguished foreigners and other paying guests—which is just as it should be). If the aspirant

gets a billet on some estate, well and good ; if he fails to get one, the hotel-keeper consoles himself with the reflection that any day he himself may be in like case. One

CANNOT ALWAYS RETURN HOSPITALITY RECEIVED,

CUTLET FOR CUTLET ;

but one can at least hope for the turn of the wheel which will convert one from a borrower into a contributor to the common fund of hospitality out of which each may benefit in case of need. But prices are high in S. Thomé—where eggs cost three pence apiece and a handful of beans in their shells is not to be had under five-pence, it is easy to understand that a hotel bill for a couple of months' residence, regarded as a debt of honour by the newly-joined planter's assistant, may prove a very heavy tax on his first year's salary. The supply of this class of labour being so far in excess of the demand, proprietors rarely if ever covenant with assistants from Lisbon, but engage immigrants from a waiting list of candidates on the spot, whose return passages to Portugal in case of dismissal or resignation are consequently their own affair. The man, who is rash enough to bring a wife and family out with him, is, of course, severely handicapped, as the

PLANTATION HAS TO RATION EVERY EMPLOYEE,

white or black, and a wife and children mean so much more food and wine out of store. Proprietors, as a rule, are liberal in their issues, but there is reason in all things ; and the single man, who can content himself with a mulatto or Cabo-Verdean mistress already on the strength of the labour establishment, is naturally preferable to the married man with white children who, in that intensely malarious climate, will be oftener in hospital than out of it until in the end they go to swell the death-rate, of the *roça*.

The most unpromising emigrants make their way out, and it is marvellous to find among the successful and satisfactory assistants men who have begun life as barbers, hotel waiters, and booking clerks, not to mention persons of much higher walks in life quite unconnected with agriculture. But whatever his adaptability, the islands are no place for the family man. I am told that with good feeding and avoidance of overwork it is possible to put in five or six years' residence at a stretch, even in the town of S. Thomé and there is a tradition of a European who did nine years in St. Antonio de Principe (one of the dismallest spots on earth) and is still alive and well. But such cases are exceptional, and it does not require much reading between the lines to see what may be the case of the poor European, housed in some corrugated-iron shed in the town, who has to tramp some twenty miles a day from *roça* to *roça* in search of work, or laden with a hawker's pack of goods for sale, dependent on chance for his mid-day meal. As often as not he collapses with fever at the gates of the plantation and has to be helped up to the hospital of the estate (I found a poor photographer to whom this had happened, in one of the hospitals I visited), leaving wife and children to shiver with ague and starve on chance charity in town. The Government of the colony, of course, repatriates in such cases, but there being no official curator *for whites*, the mischief may be irremediable before it comes to the knowledge of competent authority. The difficulty, however, is not one peculiar to these islands ; our own Australian and Canadian colonies, not to mention the Unites States, have had to deal with it, and that in a manner more drastic than sympathetic.

It has been suggested that the only real slavery to be found in the islands is here. But whether the case in hand be that of the white or the black, the use of the term *slavery* is quite unjustifiable. However, it has been freely used throughout the controversy ; and, making the large concession that it has been used in good faith, let us now see what exactly there is in it. As a rule where there is smoke it is safe to presume the existence of *some* fire. The

MAIN SOURCES OF COLOURED LABOUR FOR THE ISLANDS

are at present four:—(i) the islands of Cape Verde to the North-west; (ii) the islands of S. Thomé and Principe themselves (as regards the *moleques* or children of imported servigaes, born on the islands); (iii) the province of Angola on the main land to the South-east; and (iv) the province of Mogambique on the east coast of Africa; all four being Portuguese possessions. I will begin with the first and fourth of these sources, reserving the second and third for special discussion at the close of my letter

CAPE VERDE ISLANDERS.

The Cape Verdo islanders are a hard working and intelligent people, more or less Europeanised in mode of living, often with a certain infusion of white blood in their veins. All can speak Portuguese, and many can read and write it as well. Men and women engage themselves and are repatriated if they do not re-engage for a further period. But they are not looked on as a very desirable class of immigrant, the men having a bad reputation as *faquistas*—too handy with the knife in their quarrels, or when drunk, unoffending negro women or children who happen to cross their path being as often as not their victims. Their women do not take very kindly to purely agricultural tasks, but make good housekeepers, in which capacity they frequently enter the households of the assistants at the *dependencias*, an arrangement approved by the management of the estate, and rightly so, for it tends to minimise regrettable incidents between white overseers and black women, bad alike for discipline and for the reputation of the white man.

THE MOGAMBIQUE NEGRO.

The Mogambique negro is a labourer made of far better stuff than the Angolan, whose case I am coming to. He and the moleque of the islands may be regardod as occupying an intermediate place between the other two groups. His recruitment dates from quite recent times, but so far the experiment has been a decided success. But there are breakers ahead in this quarter. Apart from the heavy cost of transit from the opposite coast and of special clothing and bedding against the rounding of the Cape (it is these men who got themselves up as Royal Dublin Fusiliers and Midland Railway Ticket

Collectors), there is a serious risk of conflicting interests with a much more powerful rival than the West Indian cacao-planter—the Hebrew mine-owner on whose behalf Great Britain had to fight the two Boer Republics. S. Thomè has quite enough on her hands as it is, and the very one-sided convention rushed through lately between the Transvaal and Portugal opposes a fresh Scylla to the humanitarian Charybdis.

THE MOLEQUE

is the offspring of the imported servicae, born and bred in the islands. He is looked to as the ultimate solution of the knotty problem, and indeed has already furnished that solution in the case of the older and more fully devoloped properties, long independent of imported labour. But his case is open to criticism from at least one point of view, and both the planters and the Governmont have to look the facts in the face. To begin with, the moleque is born free in theory, for slavery has no legal existence on Portuguese soil. But by law he is subject (Article 64 of the Decree of 23rd April, 1908), not to his parents but to the owner of the plantation on which he is born, who is entitled to employ him (or her) from the age of 11 to 14 on certain specified tasks only, indoors and out of doors—without pay. And from 14 to 16 the moleque boy is bound to do part of the work prescribed for a man, certain specified tasks excepted, while the moleque girl has to do all the work prescribed for a woman. As to what happens after that age, the law is silent.

IS THIS "A MODERN SLAVERY," OR IS IT NOT?

If we accept the Nevinsonian definition of the term ("slavery is not a matter of discomfort or ill-treatment, but of loss of liberty"), we can only answer this question in the affirmative. But I take exception both to the definition and to the use of the question-begging epithet. In the popular sense, the term slavery connotes all manner of horrors, suggesting visions of labour in chains, the bloodhound and the lash of the brutal overseer, if it does not actually define these horrors to the exclusion of all the humaner elements. The statesman and the man of letters does not require to be reminded of the historic fact that slavery has in the past proved a valuable agency in the development of nations; and recent events all the world over are forcing it upon us that in our rolations with the coloured races we have been far too hasty in discarding that institution. "Call it slavery if you like," said a Portuguese official to Mr. Nevinson ("A Modern Slavery," p. 190). "Names and systems don't matter. The sum of human happiness is being infinitely increased." A refreshing application of the venerable doctrine of the greatest good of the greatest number; though open to question as regards the unimportance of names and systems, the whole of the present trouble being due to a "terminological inexactitude."

Let me freely admit that the law in the case of the Moleque sanctions a restriction of liberty; not only that, but that it vests the exercise of that restriction not in the parents of the child, but in the lord of the manor *in loco parentis*. But, modified by the special circumstances of the case, is not this the common experience of our own youth? What decently educated white has not been restrained in the exercise of his liberty, first at school or college, then in the acquisition of his trade or profession?—and that not by his fond parents at all, but by the schoolmaster, reinforced if need be by the cane, and subsequently by the discipline of duty? And the higher the standard aimed at, the longer and more rigorous the training. Who is going to deny that the procoss, however disagreeable from the standpoint of the schoolboy, finds ample justification in the end? What is true of the individual is true of the race, and a system proved sound for the white, may *mutatis mutandis* be reasonably assumed sound for the black, within limits of course—limits far better understood by the Portuguese than by ourselves, as our present troubles in India fully demonstrate.

The case of the Angolan in its main features is not unlike that of the Moleque, or negro born in the islands. In his native state the Angolan is so absolutely an animal that the humanitarian scores an easy point when he derides the validity of a "bilateral contract" between a more zoological specimen on the one side and an educated white on the other. Stripped of its incidental irrelevancies, this is the true issue between the humanitarian and the planter. The author of "A Modern Slavery," bitterly prejudiced, as is evident throughout his book, against the Portuguese, concedes that but little fault can be found with the treatment of the negro on the islands, though he does his best by innuendo and misstatement to convey the contrary impression. Does the Angolan go to the islands voluntarily from his native wilds, with his eyes open to the advantages and disadvantages of his bargain, as in the case of the Cape Verde islander and the Moçambique negro; or is he taken there much as a monkey is taken to a Zoo?

For reasons partly personal, but chiefly because most of the facts are too well-known to require futher investigation, I did not prolong my enquiry into the province of Angola itself. From the documonts in my possession, some of which at least are unimpeachable, others only open to suspicion as regards motives—the facts narrated being corroborated elsewhere, it would appear that the engagement of the Angolan serviçal more closely resembles the taking of the monkey to the Zoo than the taking of the Cape Verde islander to his work on the *rogas*. Similes, however, are apt to mislead, so let us take the bare facts themselves. Those who desire to have them in full detail may be referred to the pages of the "Economist ta Portuguez" and the "Voz de Angola," two journals which have done yeoman's service in bringing to light

ATROCIOUS ABUSES PRACTISED IN THE HINTERLAND OF ANGOLA

in connection with the hitherto existing system. It would take too long to recount these, but I may mention that I have just returned from an interview with the Portuguese Colonial Minister in Lisbon, who informs me that he has directed the suspension of all recruiting in Angola until Government can get out a decree providing for the establishment of an entirely new Government agency which will take recruiting out of the hands of private individuals.

Those of her critics who denounce the dilatoriness of Portugal in this matter, are very unjust —they forget that within the eighteen months or two years that have elapsed since they raised the question in its present form, she has had no less than five changes of ministry, plus the series of crises preceding and following the assassination of King Carlos and Prince Luiz Felippe.

But Angola is not S Thomé—another fact that the boycotters of the latter's produce have succeeded in completely obscuring. Putting the case on the lowest ground –that of simple commercial interest, the abuses practised in Angola

CONSTITUTE A FRAUD UPON THE S. THOME PLANTERS,

and one repeatedly complained of by them, as enhancing needlessly the cost of imported labour, apart from its inhumanity. To establish a boycott of the cacao of S. Thomé by way of punishing, not the real culprits, but a section of the victims of these, may be humanitarian logic; but it fails to convince the Portuguese public of the *bona fides* of the movement—and no wonder So far from being to blame for the abuses, the S. Thomé planting community really deservo the thanks of the civilised world for their efforts to redress whatever suffering the Angolan may have endured at the hands of his native chiefs and the emissaries of these on the African continent. This may sound paradoxical to such of your readers as have obtained their views of the case from writers such as Nevinson and Burtt, but there is another side to the story which these gentlemen have carefully refrained from placing in the prominence its merits. Let me relate

A TYPICAL CASE,

the particulars of which have been furnished me by one of the most distinguished young officers in the Portuguese African army, Captain David da Lima, Commander of the Order of the Torre o Espada who permits me to cite him by name as personally acquainted with the facts.

A number of prisoners-of-war were held by a native chieftain in the hinterland of Angola, beyond the realm of effective civil jurisdiction, where chieftains arrogate to themselves powers of life and death over their tribes. A Portuguese recruiting agent was in the vicinity, and the chieftain made overtures to him for the sale of these prisoners, whom he looked upon as a serious expense to himself. The Portuguese Agent, however, knowing that the British humanitarian was on the warpath, too, and had succeeded in worrying the colonial authorities to the extent of making the latter eager to find a scapegoat, declined to deal otherwise than on the basis of an individual payment to each man engaged, and a regular hiring contract. This did not suit the chieftain's book at all, so he summoned the Portuguese to a palaver, produced the captives, and, finding the Portuguese obdurate, proceeded to cut off the heads of his men, one by one, remarking that they wore evidently of no use to anybody. This was more than the Portuguese could stand, so he yielded the point, took the risk, and rescued the remainder of the men from their sentence of death. It was the only thing he could do, and an Englishman would have done the same in like circumstances; but the authorities had their eye upon him, and he was arrested, tried and punished, his case being cited to the humanitarians as evidence of the readiness of the authorities to suppress mal-practices.

But whatever the circumstances of the Angolan's engagement in the interior, his troubles are at an end with his arrival at the coast. He is presented to the Curador at Loanda or Benguella as the case may be to whom he makes a

DECLARATION OF WILLINGNESS TO GO TO THE ISLANDS

(he has but little choice in the matter), fully believing he is going to a speedy and possibly a painless death. When he arrives at S. Thomé, his astonishment is profound. As often as not, his first question at the Curadoria is "am I really alive, or are these the regions beyond death?" He has not recovered from his terror at the sight of the sea and the sensations attendant on the voyage. Translated to the plantations, his astonishment continues. He is, of course, useless for work and none is expected of him for the first month or two. Everything is new and strange, and for his first year he is placed under the tutelage of an old hand of his own race, who teaches him how to wear his clothes, how to feed himself, and many other things a child learns in infancy, but he has yet to learn. He has next to be taught to work, to turn out up to time, to obey orders and make himself generally useful. Occasionally he rebels against this, but as a rule he is docile and passive if not actively willing.

For my part, I confess I fail to understand

WHY THE S. THOME PLANTER PREFERS THE ANGOLAN

to any other class of negro, but such seems to be the case. He is cheap—very cheap—that is true. But personally I would go so far as to say, varying Mr. Nevinson's concluding dictum ("A Modern Slavery") that it were better for those islands, if not for humanity at large, that not another Angolan should be imported. The Angolan is as often as not physically feeble, due generally to hereditary disease so prevalent in the African interior—so much that his passing the Doctor is more or less a scandal. (If it is true that the Doctor's fees depend on the number he passes for embarkation, the system is to blame for this fraud on the planter.) But were I to put aside the business aspect of the case, and regard it as a purely humanitarian question, I should vote for the resumption of the immigration as soon as the hinterland abuses can be reformed out of existence; but I should say as little about repatriation as possible—this last I regard as a mischievous fallacy from whatever point of view it be regarded. As to improving matters on the *roças*, it might be possible to hurry the pace by intensive educational culture, but with the Sierra Leone negro, the Poona Brahman, and the Bengali Babu before our eyes as the *fine fleur* of British colonial culture, least said soonest mended. Space forbids my bringing into the discussion the

TRANSVAAL CONVENTION

bearing the appropriate dato of 1st April of this year,

OUR LATEST PRACTICAL JOKE AT THE EXPENSE OF PORTUGAL,

and of its provisions for the perpetuation of what much more deserves the label of "A Modern Slavery"—the status of the Mocambique negro in the Rand Mines, and the methods by which *he* is recruited, under the British flag. But with all these deviations from the normal before us, the Portuguese colonist may well exclaim:—"Physician, heal thyself!"

J. A. WYLLIE, F.R.G.S.
Lieut.-Colonel, Indian Army (Retired).

RUBBER IN PAPUA.

Mr. A. S. Bloomfield, who has returned to Melbourne after a visit to the New Australian Federal Territory, of Papua, is convinced that rubber planting will become a most successful industry in the "wet belt" there.

Para rubber seeds brought from Ceylon have in some cases attained a height of 22 ft. in 15 months from the date of planting out. Great care has been taken in choosing the sites for plantations. In each case a water frontage was obtained. About an acre of ground was fenced in with pig-proof fencing, and thoroughly trenched. Seeds were then planted about 4 in. apart, in beds. A rough glass roof was built in order to protect the young plants from the extreme heat. Suitable positions for manager's quarters and stores were then picked, and the work of clearing was begun. After the timber had been felled and burnt, the estates were lined and holed, and immediately the wet season commenced the young seedlings were transplanted into the plantation, and shaded with shade baskets made out of banana leaves and other material.

Mr. Bloomfield states that the trees grow much more rapidly in certain parts of this territory than in other tropical countries. The rainfall in the "wet belt" is 80 to 150 inches per annum.—*India Rubber Journal*, Sept. 20.

GERMINATION OF CEARA RUBBER SEEDS.

A rapid method of germinating Ceara rubber seeds is in use at La Zacualpa Botanical Station, Mexico. It consists in placing a layer of fresh horse manure in a box, to the thickness of about 6 inches, spreading the seeds on the surface, and covering with about 1 inch of the same material mixed with a small quantity of sand. The soil should be slightly packed, and the box covered with glass. If put in a warm place or in the sun, germination will take place very quickly. The seedlings should be planted as soon as they are an inch or two high, and some manure added to the soil. After such treatment the seedlings will grow very rapidly. In planting at stakes the holes should be made as large as possible, or at least 4 feet square. The soil should be well watered, and if too sour, some lime should be added before planting.—*Barbados Agricultural News*, Sept 4.

EXPORTS OF RUBBER FROM PARA.

AND COCOA AND BRAZIL NUTS.

The following particulars of the exports of rubber, cocoa, and Brazil nuts produced in the State of Para during the crop years 1906-7, 1907-8 and 1908-9 have been furnished by H. M. Consul at Para (Mr G A Pogson):—

	Rubber.		Cocoa.		Brazil Nuts.	
	Met. tons.	£	Met. tons.	£	Hectolitres.	£
1906-7	11,467	3,285,000	1,668	82,000	41,521	48,000
1907-8	10,189	2,209,000	2,449	160,000	80,255	103,000
1908-9	11,729	3,177,000	3,392	142,000	80,797	71,000

Metric ton = 2,204 lb.; hectolitre = 2·75 Imperial bushels; the milreis has been converted at 1s 3d.—*Board of Trade Journal*, Sept. 16.

RUBBER IN SIAM.

H.M. Consul at Senggora (Siam) states that the only foreign-owned rubber plantation in the Monthon of Patani is near Bangnara. It is owned by an Englishman and was started about four years ago. Reports with regard to it are favourable, and the Consul calls the attention of persons interested in rubber to the possibilities of Patani as a rubber-producing country.—*India-Rubber Journal*, Sept. 20.

CINCHONA IN JAVA.

TEA TAKING ITS PLACE.

Amsterdam, Sept. 22.—The report of the Bandoeng Cinchona Manufactory mentions that during the preceding year 1,020,917 kilos. Cinchona bark were worked, containing 61,582 kilos. sulphate of quinine, or, after deduction of waste, 58,619 kilos. Of the quinine produced the Government of Netherlands India received 18,929 kilos. The balance was sold in auctions at Batavia and settled with the private planters. The price at which the manufactory accounted for the delivered bark with the contracting undertakings was based on a payment of fl. 7.50 for the quantity of bark required for 1 kilo. sulphate of quinine, so that these undertakings enjoyed considerably more benefit by delivering to the manufactory than by shipment to Europe; for the price of bark on the Amsterdam market declined to about c. 3.15 per unit. The production of Cinchona bark appears to exceed the world's consumption, and, moreover, it is said that the quinine manufactories in Europe and America have formed

A COMBINATION WHICH FIXES THE PRICE AT THE AMSTERDAM AUCTIONS.

This combination, it is rumoured, buys up all the quantities of bark offered for sale, and thus makes a reserve, enabling it to abstain from buying for a long time if planters try to command higher prices or refuse to sell on the present low basis. However, it is not impossible that the contrary will occur and that buyers will have to pay much higher prices in order to encourage the production. On many Cinchona undertakings plans are already in operation to cultivate tea instead of Cinchona. The working account exhibits a profit of fl. 104,492, out of which a sum is proposed for writing off, and the balance allows a dividend of 10 per cent. to be paid to shareholders.—*L. & C. Express.*

A LECTURE ON FIBRES.

AT THE MYSORE DUSSERAH INDUSTRIAL EXHIBITION.

Mysore, Oct. 20.—Mr G H Krumbeigel, the President of the Committee, [who was a visitor to Ceylon at the Peradeniya Rubber Exhibition of 1906.—Ed. *C.O.*] set an excellent example this morning by delivering the first lecture of the series arranged in connection with the Exhibition this year. He said a few words first as to the changes which had made it possible to provide a separate Lecture Hall, and of the general object with which lectures were to be delivered, and he then asked the Dewan of Mysore, Mr T Madhava Rao, to open the Hall. The Dewan expressed readiness to do anything he could, and remarked that the Hall was already open on all sides, so that there was not much left for him to do.

Mr. Krumbeigel's Lecture on Fibres.

Mr. Krumbeigel then addressed the audience on the subject of "Commercial Fibres." The general tenor of his remarks is shown in the report appended, but I should like to add here that many passing references to exhibits that were picked out as illustrations have had of necessity to be omitted, and that the lecture, as a whole, constituted an earnest appeal to enlightened men in Mysore to take practical steps to utilise some materials that are now thrown away as useless, and to devote attention to the cultivation of certain fibres that appeared to him likely to prove successful as commercial ventures. The lecture was simple, practical and instructive and was applauded with heartiness. The following is an outline of what was said :—

In the commerce of the world fibres hold a very high place, and a knowledge of this subject is of the greatest importance. To treat the subject anything like exhaustively would require a long series of lectures. My object being a simple introduction rather than a scientific elaboration of the subject, the remarks must of necessity be brief and general. The uses of vegetable fibres are almost inexhaustible. Besides those very important classes employed in the weaving industry, in paper manufacture, for cordage, etc., there are a very great number that support other special industries, either direct, as in case of the incandescent mantles, or indiroct, when they form admixtures to animal wool, silk, etc.

The Classification of Fibre Plants.

Apart from the classification according to their utility we may study fibres morphologically according to their structural distinction; that is, whether they are derived from the bark and stem and as in case of bast fibres, from the leaves, *e.g.*, agave fibres, or are seed-hairs, such as cotton, etc. You may also study them botanically according to their natural order, but this is often complicated by the fact that one and the same plant may furnish different kinds of fibres. Notwithstanding the great variety of fibres and the very different kinds of plants yielding them, the essential element on which their value depends is always the same. A fibre, to be of any value, must consist of a substance chemically called cellulose—the larger the percentage the better, in a general sense, is the fibre. Cellulose may be described as the essential part of the framework of plants. In the young cells of plants the wall is found to be of a delicate but firm and elastic membrane. This wall consists of cellulose. As the plant grows, many cells become encrusted with resins and other substances which in some parts fill the cavity completely; in some tissues, however, little or no incrustation is formed, and though the cell walls thicken they consist almost wholly of cellulose. The seed-hairs forming the cotton and the floss of the silk cotton are almost pure cellulose. Though cellulose is found in all parts of the plants, the parts of special value for yielding commercial fibres are the cells which occupy a definite area or position in each plant. These are called fibre cells. But it would be going beyond the scope of this lecture to enter into the morphological details in the different kinds of fibre plants. In order, however, to investigate raw fibre, a botanical study is necessary. In the great division of plants Dicotyledons (plants having the parts of the flowers in fours or fives and with leaves the veins of which form a network) the fibrous cells are to be found in the bark, the middle or lower layers. In the Monocotyledons (plants with parts of flowers usually in threes or sixes and leaves with parallel veins) the fibre cells are built up with vessels into composite structures known as fibre-vascular bundles, which are regularly distributed in the fleshy leaves and stems, and are not formed into a continuous tissue as in Dicotyledons.

The Investigation of Fibres.

Now on the uniformity of length and diameter, the tenacity, flexibility and smoothness of the fibre, bundles (or filaments) depends the spinning quality, whilst the length, thickness of walls, tapering ends of the fibre cell are very material factors in the strength and durability of the manufactured goods. In careful investigation, such as commercial experts have to make, a microscopic examination would therefore be necessary, as also chemical investigation in order to determine (*a*) its hygroscopic moisture—that is, the moisture taken up by a fibre after being dried in a high temperature; (*b*) its mineral constituents, that is, the porcentage of ash left after burning the fibre; (*c*) its percentage yield of cellulose on the raw fibre. Commercially, fibres are generally classed according to their utility. (1) Textiles (cotton) flax, Rhea, jute, ramie, etc. (2) Rope or cordage fibres—Manilla —Sisal, Mauritius hemp. (3) Brush and mat fibre (coir, etc.) (4) Paper materials. My purpose being an introduction to the principal fibres exhibited, I will take them up now and add a few remarks on the cultivation, geographical distribution and commercial aspect as we proceed. The samples that I shall pick out from the large collection exhibited belong chiefly to the second group, because it is among these that we find some very promising kinds which are either new or not sufficiently known here, while others pertaining to special industries such as the textile and brush manufacture and paper-making must form subjects of separate lectures.

SISAL FIBRE TAKES FIRST PLACE.

A very large and important group are the agave fibres, wrongly called aloes. Every species of agave or Century plant contains fibre, but we may regard some twelve species as yielding commercial fibre. Foremost is, of course, the Sisal hemp, *A. rigida var. Sisalana*. It is a native of Yucatan and was first introduced to Europe in 1879. The fibre is far superior to any of the hemps. Cordage made from Sisal is much more durable, lighter, and much more pliable than those of hemp. It requires no tarring, and as it stands the alternations of dryness and moisture with little injury it is now largely used in naval cordage. Tarring considerably injures ropes, and on that account Sisal, which requires no tarring, is not only much stronger (some say four times), but has also a much longer life than other hemps. Sisal is of comparatively easy culture; it requires but little attention once it is established, but not having any marginal spines or teeth, it should be protected from cattle when young. The cultivation of Sisal has now spread all over the tropics, and samples from British East Africa lately fetched £35 per ton. We have a large number of plants that are poling, and I am sorry to see that so little is taken up in the State. While I send some 50,000 bulbils annually upcountry, it pays the Garden, but does not help the State. I should strongly advise taking up Sisal cultivation.

MAURITIUS AND MANILA HEMPS.

Similar to Sisal is the Mauritius hemps *Fourcroya Gigantea*. Originally introduced to the Mauritius from South America, it is now a valuable industry in the Island. It has a better lustre and firmness and is used for more ornamental cordage than Sisal, but is not nearly as strong. On the other hand, it is even more easy of cultivation. Another fibre allied to the class is the Bowstring hemp, *Sanseveria*. There are some four or five species in cultivation, and its fibre has been valued at £30 per ton. Cultivation is comparatively easy and yet one does not often see it commercially grown. No doubt it has a serious competitor in the Sisal and Mauritius hemps. Manila hemp will be familiar to you all, as much is being imported and used here. It is furnished by a plantain tree. *Musa textilis*, and, as its name implies, comes from the Philippines, Manila hemp is still the most used of white cordage fibres and rules the prices, as much as £50 being paid. We have now a good number growing in the Lal Bagh, and as soon as I can find suitable spots in the districts I hope to send it out. In the machine shed you will be able to see a hand machine such as is used in the Philippine Islands for extracting the fibre. It is used here for extracting fibre from the common plantain tree. This fibre, though not by any means comparable with Manila hemp, has its uses, and I should strongly advise growers of plantains to invest in a machine of this type and extract the fibre from the stems, instead of throwing them away. These have so far all been fibres derived from the Monocotyledons.

RAMIE OR RHEA.

To take a few of the other section. Ramie or Rhea: *Boehmeria nivea* (a plant of the nettle family). There are two forms of the plant yielding this fibre. The one furnishing the true China grass has leaves with a white surface beneath. This form grows largely in Assam and is essentially a temperate plant. The other form *B. nivea var tenacissina*, is a tropical plant and furnishes the Ramie fibre proper. It will be evident from the terms temperate and tropical that the first will not do in the temperatures where the true Ramie will do, and it is possible that in many places the failure of the Ramie is largely, if not solely, due to the fact that the two have got mixed up. Even in commercial circles Ramie has been generally mixed up with China grass, and it has led to disputes, so that it is difficult to say which is the better in quality. However, Indian Ramie has generally been considered inferior. This and the difficulties in extracting the fibre and freeing it from resinous admixtures caused its cultivation in India to decline. Subsequently, however, better machines were invented, and with the advent of the incandescent mantle came an increased demand for Ramie, so that as much as £50 and £60 has been paid or offered per ton. Ramie is also largely used in the manufacture of electrical goods, but there is now a new paper patented in Italy, which, it is said, will supplant Ramie (so far as those industries are concerned at least). On the other hand, there is increased demand for it in the manufacture of underwear in the northern countries of Europe, and now that we are likely to make our holiday trips by aeroplane to the North Pole, instead of to Ootacamund this, demand is bound to increase. Ramie requires some cultivation, but it is worth taking up.

THE MADAR PLANT.

Another fibre I must mention here, which is also largely used for incandescent mantles, and that is the Madar (*Calotrovis gigantea*). It is growing as a weed throughout India and has, to my knowledge, so far not been in cultivation. Its seed-hair as well as the fibre from its stem are very silky and I presume are largely used as admixture with silk.

A NEW FIBRE YIELDING PLANT.

The latest thing in fibres is a plant closely related to this *Calotropis*, and as this is likely to prove a great success I have put it under extensive cultivation with a view of getting plenty of seed for distribution. There is hardly any literature on this fibre yet, but to describe it I will just read to you an extract of what the discoverer says (in the *Gardeners' Chronicle*, I think, it was)—*Asclepias semilunata* by Chas. A White, F.R.H.S., etc., "When the South African war broke out, I got the war fever, and proceeding to Africa, remained there, having travelled from the Cape to the Zambesi, Portuguese Africa, and then to the Equator and Congo. In all these countries this particular plant was seen in isolated parts, but not cultivated. Nobody knew of its value; only that the silky cotton could be used like kapok for stuffing furniture, and would not pay to export. This is merely mentioned to show that it can adapt itself to various climates, although indigenous to the Congo, Uganda and Abyssinia. While at Uganda, planting rubber at the head of the

Nile on the Victoria Nyanza, I wanted some rope for a line, and requestod a native to get some, thinking he would get the bast of a banana. Much to my surpriso, the boy started pulling this particular plant, and drawing the fibre, then twisting it into rope of remarkable strength. I then forwarded samples of rope, fibre and botanical specimen to the Imperial Institute, London, with the result that the plant was identified as *Asclepias semilunata* and the fibre, if properly prepared, was valued, on the London market, at £35 per ton. The examination of samples sent from Uganda has shown that it is very strong and of excellent quality, and would doubtless be usoful for cordage manufacture, but it has not yet been exported in sufficient quantities for actual trials on a manufacturing scale. It is possible that the fibre might also be utilised for the manufacture of explosives, but this question is at present under investigation. I sent a sample of the fibre and a quantity of seed to tbe Hon. John Perry, M.P., to test if it can be successfully grown in New South Wales. I feel confident that it can be profitably grown, as its geographical distribution is so well-known to me. I have seen it at an elevation of 7,000 ft. above sea-level at Johannesburg ; also at Rhodesia and in Australia ; but have not seen it near the coast, though it may succeod near the sea. The cultivation of *A.semilunata* is simple : sow as you would wheat or oats, after the land has been harrowed ; seed thickly, so as to produce stems 5ft. to 6ft. long. It will grow on stony land, on the flat or hill-sides ; it requires no irrigation, and will withstand drought with impunity. With cheap freight from Sydney to London, let alone local market, this fibre may prove to be a desirable subsidiary industry for New South Wales." The writer, who is an Australian, thinks that the seed must at some time have been introduced into Australia by the late Baron von Mueller ; otherwise it is a mystery how he saw it at Coolgardie. Tho writer trusts that through the columns of tho *Agricultural Gazette* more will be heard from tests in New South Wales.

"The sample of fibre forwarded to the Hon. the Minister for Agriculture was submitted to Messrs. Forsyth & Co., rope manufacturers, Sydney, who reported as follows :—" The fibre is equal to Manila, and is valued at £35 per ton. The length and colour are good. They would give £35 per ton for it, but the fibre must not be less than 4 ft long. The quantity submitted was too small to make a test."

This, gentlemen, must be enough for today, and if the lecture will result in a closer study of the fibres that are exhibited, and will lead to wider cultivation, it will havo served a good object.—*M. Mail*, Oct. 22.

MEXICAN RUBBER.

In an extract from the *Daily Express* on Mexican Rubber it is stated that at an altitude from 400 to 600 feet there are 20,000 trees of from *six to nine years'* growth, ready for tapping in *two years'* time. This means that the growth of the tree is much slower in Mexico than either Ceylon, South India or the Straits. Fancy not tapping rubber trees till they are 8—11 years old !

NOTES FROM NYASALAND, B.C.A.

TOBACCO—COTTON—LABOUR—RUBBER—TEA—CHILLIES.

Mlanje, Sept., 1909.—Tobacco is now paying well here, owing to this product attracting the attention of home manufacturers. The prices paid in the London and Livorpool market ranges from 4d. to 1/3 per lb. ; tho same prices, plus a small profit, is obtainable from the Imperial Tobacco Company at Limbi, near Blantyre; so there is every prospect of this industry making rapid progress in the country ere long. It has been proved beyond a doubt that Nyasaland can grow an excollent tobacco, both heavy dark shipping varieties and the light fashionable fine-cured orange leaf, as soil suitable for both kinds is to be found all over the Protectorate. Only men and money is wanted to develop this industry. Tobacco

COSTS FROM 2D. TO 3D. TO PRODUCE AND PUT ON THE MARKET,

so that there is a good margin of profit for those who grow it and are able to turn out leaf of a good quality. To enable planters to do this the courteous Manager of the Imperial Tobacco Co., Mr Boyd, gives seed free, and his advice too, visiting all those who aro growing the weed, instructing men most carefully as to the proper methods of curing, &c., to enable growers to produce the most suitable quality for the home market. To prove how valuable this expert advice is, I may mention an instance of Mr R——, who had no previous tobacco growing or curing experience, putting in 200 acres in one year near the Railway line and successfully growing, harvesting and curing the whole crop within the year. With an expenditure of about £1,000 he was able to secure £3,000 (I am informed) of profit and left the country last month on a well-earned holiday.

This gentleman, however, is one amongst many who are not so successful ; for he worked very hard indeed, night and day, watching the temperature of his barns—so that he was exceedingly lucky and succeedod in obtaining top prices for his crop. He was in consequence much run down in health and in need of the holiday in the old country where he has gone to recruit.

TOBACCO CROPS THROUGHOUT THE PROTECTORATE

have been very good on the whole this year and up to 500lb. per acre has been secured on some estates that were woll cultivated and have the soil best suited for the growth of the plant.

COTTON,

in some districts, has done very well this year and better results are anticipated as the most suitable varioties are being found out with tho advice of

THE NEW DIRECTOR OF AGRICULTURE

who is very sanguine of the success of this industry, when more suitable acclimatised seed is used and somewhat different methods of planting and cultivation have boen adopted under his guidance.

All over the country

NATIVES ARE TAKING TO GROWING COTTON

to be ablo to pay their 3/ annual hut tax ; for they cannot get employment even one month out of the year to enable them to earn this small wage, owing to increase of population and the want of people to develop the resources of the country.

Nyasaland natives are not anxious to emigrate any more than Asiatics are, for they are fond of their homes andfamily ties like other human beings. Government has to devise ways and means of being able to secure revenue, as the hut tax cannot be paid by a people who have no money, so a system of emigration has been again started and large numbers of

OUR LABOURERS ARE BEING SENT TO SOUTHERN RHODESIA

and elsewhere to work. The wisdom of this policy is disputed by all right-thinking residents who have the interests of the country at heart; besides, the natives themselves object, but being told by Government Officials that they *must* go, of course they obey. Although Government men say they are not pressed, all those who aro behind the scenes know better and a Commission of enquiry into our system of emigration would certainly expose some high-handed proceedings on the part of Government Officials who are connected with the export of labour from Nyasaland Protectorate.

A MUCH WISER POLICY THAN EXPORTING OUR LABOUR

would be to educate them and encourage them to grow valuable economic products (which they know full well how to do, as they are born cultivators) for sale to traders who would export them ; for it is an expert that is needed to make Nyasaland go ahead. This, however, means some expense and a little trouble to the official element which does not seem to meet all their views sufficiently to support or encourage; none so blind as those who will not see.

COFFEE

continues to form one of our largest exports, and some estates, where climatic influence favours the successful growth of the fragrant berry, continue to give fair crops, although the cultivation of this product is giving way to tobacco, cotton, &c., owing to the experience of the past having proved how unreliable and uncertain the return from this coffee is now-a-days.

RUBBER

has attracted much attention of late, owing to big prices and the rapid growth of ceara in the country. Considerable extensions have been made all over the country ; it is quite common talk to hear of the big fortunes that so and so is to make in the course of five years! ? It is certainly wonderful how the price of rubber keeps up, but—and there *is* a "but." Wait till the trees that have been planted all over the Tropical World come to yield; and it remains to to be seen whether (notwithstanding the new and various uses that rubber is being put to now-a-days) prices will not go below paying level, the same as cinchona did in the seventies in Ceylon, India and Java. May the boom long continue, however, as it means the spending of a lot of money that people can afford to gamblo with in Company shares. Some seed of the new varieties of rubber nearly allied to ceara have germinated and are growing well in different parts of the country and a good number of Para are doing well, from one to three years' old, So in time we will have better latex-yielding varieties of rubber in the country than ceara. The natural rubber of Nyasaland is almost finished, the exports are getting less and less every year.

TEA

is attracting some more attention now it is showing amongst our exports, hitherto, most of the tea grown was either consumed in the country or sent to South Africa, but during the present year some 30,000 lb. have been sent to the London market where prices ranging from 4½d. to 7¾d. have been realised, which proves that Nyasaland will grow a marketable tea.

The methods of curing have hitherto been the old-fashioned hand-rolling and firing over chulus with charcoal, a very risky and dirty method; unless carefully watched during the finishing off stage, the tea is liable to get burnt, which spoils the tea and gives an objectionable rank flavour, which means 2d. per lb. less value.

Well does the writer remember the old charcoal days of firing tea in Ceylon before any machinery was invented, when the trays were constantly requiring new cloth and the tea was always burnt, and all sorts of devices were resorted to to prevent the coolies burning it. Also how kind and willing, the late James Taylor of Loolecondera was, to show any new tea planter his careful methods of tea-curing when we used to send a few coolies to learn rolling, &c., and be present ourselves during the teaching. The late William Cameron, too, was the tutor who first gave early-day tea planters in Ceylon their lessons on hand-rolling and fine-curing of tea and many tea planters were much indebted to him for his careful teaching of the Indian methods, which he had thoroughly mastered during some 16 or 18 years in Assam before coming to Ceylon. There are few planters of the present day, who will remember the above named gentlemen, who had to be thanked for their assistance to the pioneer tea planters of Ceylon.

Mlanji can now boast of having two tea rollers (Jacksons), one on Lauderdale and one on Thornwood estate, and a Sirocco (Davidson's) also on the latter estate, so that a better quality of tea may be placed in the market from date.

A considerable area of

NEW LAND IS BEING CLEARED FOR NEXT YEAR'S PLANTING

on the old tea gardens and two new estates are being opened up rapidly, 100 acres or so at a time, viz., Ravensby and Leechmiya. The latter was the Nyasaland Coffee Company's property, where some £13,000 was spent in trying to make coffee pay and subsequently sold to a Nyasaland planter, very cheap indeed, so this late N. C. Co.'s estate may in time become a valuable tea property.

The Company, during its existence, sent a large consignment of tea seed from Ceylon—so that the one product, coffee, should not be solely

depended upon, but the whole lot of seed failed to germinate; and as no seed could be got in the country at that time, the attempt to turn the Company's estate into tea failed and like many other pioneering Companies was soon afterwards closed down.

In the course of time Mlanji district will become a large tea-producing division of Nyasaland as the bush, when once established, has been proved to yield well and has no natural enemies to speak of.

CHILLIES

form a considerable item in our export list. They are easily grown and give a considerable amount of crop within two months of the date of planting and last for two or three years, giving crop for 2½ years after the date of planting. Good prices are got for bright cured chillies, from 45s to 56s per cwt., and the natives can pluck about 5 lb. each per diem which turns out about 1 lb. when dry, so there is a good margin of profit. They make an excellent catch-crop and take little out of the soil as they are composed of 80 per cent. of woody fibre.

H. B.

RUBBER CULTIVATION ON SO-CALLED PEAT SOIL.

By H. N. RIDLEY.

In many parts of the Malay Peninsula usually in the vicinity of large tidal rivers we find a somewhat peculiar soil formation popularly known here as peat formation. It consists exclusively of dead timber roots and decayed leaves, to a depth sometimes of as much as twenty feet. Often no trace of clay, stone or other mineral matter is to be seen in it. The formation appears, even if deep, to be of comparatively modern date, geologically speaking. Before being cleared for planting it is seen to be covered with dense wet forests, in which grow a number of somewhat peculiar or local plants mixed with many trees which also occur on more ordinary soil. A characteristic tree is the Kempas, *Cumpassia malaccensis*; abundant, too, is the well-known red-stemmed palm, *Cyrtostachys lacca* and the ground is often covered with an abundance of Gingers (*Scitamineae*) and ground orchids. Walking through these woods one often sinks deeply into a mass of wet decaying leaves, over and through which lie the great roots of the big trees. Below this great mass of decaying vegetation is usually a greasy blue clay lying at various depths and apparently mainly old Mangrove mud and over which this forest has gradually grown. When felled and burnt this so-called peat after a period of exposure commences to shrink, the surface of the ground often soon falling a foot or more. The exposed surface wood decays and forms at last a brown powdery soil, mixed with fragments of sticks, etc. and reminding one of the surface of an old tan yard. The water which fills the drains and streams from this formation is dark brown, resembling the brown peaty water of a Scotch moor, but is by no means safe to drink though it has only a slight peaty flavour as it is apt to produce a violent diarrhœa and has been known to cause much sickness of this nature among the coolies working in such land.

We have not seen any analysis of either water or soil from such ground but it is probable that it contains an excess of humic acid and also of salts of magnesia, sodium and potash.

Not long ago I visited the

FIBRE PLANTATIONS

of the Peneiro estate in South Johore, recently floated as a Company. Here *Sanseviera*, *Agave sisalana* and *Fourcroya gigantea* were being cultivated on a large scale for fibre making. I was much struck with the appearance of the sisal hemp, *Agave sisalana*. This plant long in cultivation in the Botanic Gardens in Singapore has never really made good growth, though being a desert plant, such as is scientifically called a *xerophyte*, it had been planted in the driest corners of the Gardens.

In this damp mass of decaying logs and branches, it was growing luxuriantly. The plants were strong and healthy; in fact, quite handsome and throwing up suckers in every direction—the suckers growing wherever they happened to be thrown. *Fourcroya* and *Sanseviera*, which, however, are much easier plants to grow here were also doing well. One would not indeed have been prepared to find a xerophytic plant cultivated successfully in dry sandy places in the West Indian Islands thriving in a strongly peaty damp locality. On exactly similar ground I have seen Para rubber planted on a large scale. Now Para rubber is a typical *hygrophyte*, that is to say, a plant adapted for growth in the wettest regions of the tropics, the region known as the "*Tropical Rain-forest Region.*"

For a short time the little rubber plants looked all right, but only for a very short time. The mortality was frightful. The dead ones were replaced in vain. The plants all looked sickly and died, some from attacks of *Fomes*, others perhaps from termites, some from unknown fungi. The dead plants were pulled up were remarkable for their long tap root and for the fact that all the roots descended vertically parallel to the tap root. As every planter knows, the Para rubber is a high rooter throwing its roots out horizontally over a large area. Here the roots were descending vertically as if seeking to reach the clay bed which underlay the peat at a considerable depth. Where the clay came near the surface, the plants undoubtedly did better but a depth of 12 feet or even less of the vegetable débris was fatal to them.

It has been shown lately by experiment that a wet swamp of peaty soil, that is one with an excess of vegetable matter is not *hygrophytic* but *xerophytic* and that the plants naturally found there are specially adapted for drought, that is to say, a shortage of water.

The reason for this is that these peaty soils contain in their water an excess of humic acid. This acid has so deleterious an effect on the protoplasm of the plants not especially adapted for growth in such soils, that the water, which

should bo taken up by the roots, is actually poisonous and cannot be used by them at all. In fact, it has much the same effect as sea-water.

Nothing could be more unsuitable for the Hevea which requires a lot of water and requires it good. Plants in soil such as this become weak and very soon succumb to the attacks of fungus. They havo no strength to resist any disease. In any case they could never make healthy trees, even if there was no fungus about. In ground of this nature I have recently heard of a mortality of 100 per cent, and that the area planted has had to be entirely abandoned. In many parts of the Peninsula there are still left considerable areas of similar soil to this I have described, and planters would do well to avoid this ground entirely for rubber planting.

H. N. Ridley.

—*Straits Agricultural Bulletin*, for Oct.

RUBBER PLANTING DISTANCES.

AND FORM.

To the outsider desirous of taking an intelligent interest in his plantation investments, one of the most open questions seems to be the correct planting distances between trees. No two authorities agree on this point and individual planters all seem to have their own ideas. Time will doubtless show whether room for the ultimate possible growth should be provided from the outset, or whether a much closer distance should be adopted while the trees are young.

Apart, however, from planting distance there is the matter of planting form. So far as can be gathered from publicly issued prospectuses and reports, the great majority of estates are planted either on a true rectangular system or on the equivalent diagonal system ; the statement being generally that "the trees are planted (say) 16 × 16 = (say) 170 to the acre." The standard books on Para rubber contain no reference to any other lay out.

Is the rectangular system the best to adopt ?

It allocates to each tree either a square, rectangular or a diamond-shaped plot for root and branch extensions, before interference or contact with adjoining roots and branches, and it tends to squared fields or blocks with avenues and roads at right angles.

Of rectangular systems the square is obviously that in which the whole ground area is earliest covered by roots, i.e., brought under contribution. With equal area per tree the other rectangular forms with one long and one short axis (e.g. 20 ft. × 10 ft) involve very early interference in one direction and long roots to cover all the ground in the other direction.

If it be conceded that the natural, unrestricted, root-and-branch extension is substantially equal in all directions round the trunk, then the area allocated to each tree should be concentric with the trunk, and a series of circles would represent the growth at any time prior to contact. After contact the circles merge into hexagons.

It is submitted that the hexagon is the true form of ground area which should be given to each tree for the best possible results in the way of rapid growth and ultimate development.

With any given minimum distance between trees—fixing the period of unrestricted root and branch extension before the first check of interference—a block planted on the hexagonal system will carry 15 per cent more trees than if planted on the rectangular or staggered system thus :—

Planting Distance.	Square Lay-out.	Hexagonal Lay-out.
18 ft.	134	154 trees per acre.
20 ft.	109	126 trees per acre.
22 ft.	90	103 trees per acre.
24 ft.	76	87 trees per acre.

The hexagonal system leads to avenues in three directions and facilitates working a block of any size to a local centre if decentralisation be desired. It is particularly easy to lay out.

It is not suggested that this discussion is original because the present writer knows of one, but only ono, rubber plantation where the system has been adopted.

ROBERT THOMPSON.

25th September, 1909.

—*India-Rubber Journal*, October 4.

THE QUALITY OF CEYLON RUBBER.

A German Chemist's Opinion.

Mr. Wm. Pahl, chemist, Judge of Commercial Affairs, and proprietor of the Dortmund India-rubber Factory, Dortmund, Germany, selected by the German Government to visit rubber-producing countries in the interest of science, in conversation with our contemporary's representative yesterday, said ho had visited estates at Baddegama, Alutgama, Panadure, Kalutara, had run up to Peradeniya, and also Kurunegala. It depended on the articles to be made whether manufacturers would prefer biscuit or sheet rubber, but, on the whole, they preferred sheet. The Ceylon quality was splendid, and the industry in the whole East had a great future before it. From a manufacturer's point of view the quality of Ceylon rubber, however, is not as good as the rubber from Brazil. The latex is treated with acetic acid, but he did not think a great deal of that process. Probably attention ought to be given to manuring. There was very good soil in Ceylon. He had taken samples, and tests would be made at home. The prices would not remain at the present high figures when more rubber is placed on the market. Next year manufacturers hoped the price will be about 5s. Prices would be fixed in February or March, because at that time the supply from Brazil will be forward. It was expected that there would bela 10 per cent increase on the previous year's stock, and, naturally, although the price two or three years hence may be 3s to 3s 6d a lb., the market would depend upon the production.

RUBBER IN BRITISH NORTH BORNEO.

If Rubber trees continue to give 3 lbs. of dry rubber daily, as shown in an extract (in our daily) from the *North Borneo Herald*, that is the country to grow rubber in ! No wonder the Companies' £1 shares, which, about a year or two ago, were to be had for 13s and 14s, are now selling for £1 5s.

TAPPING RUBBER TREES IN BRAZIL.

In the *Magazine of Commerce* for this month appears an article on "The Cultivation of Para Rubber." In the course of this we are given something of methods in Brazil. There the trees are tapped during the dry season, which varies in different districts. The rubber collectors, or "seringueiros," search the forests for suitable trees, about two feet in girth. An incision is made in the bark with a special tool, and the latex begins to run at once. A few hours after the contents of all the cups are transferrod to a larger vessel. The next step is to convert the still liquid latex into solid rubber. A fire is lighted, and on it are placed nuts of various species of palms. These produce a dense smoke, containing acetic acid and creosote, which rapidly coagulates any latex exposed to it. A kind of paddle is dipped in the latex and held in the smoke. The rubber coagulates, forming a thin layer on the paddle, which is then dipped into the latex and again smoked. Another layer is deposited on the first, and the process is continued until a sufficiently large mass of solid rubber has been collected on the paddle. It is then removed and is ready for sale and export,—*L. & C. Express*, Oct. 15.

PRODUCTION AND CONSUMPTION OF RUBBER.

(*To the Editor*, "*India-Rubber Journal.*")

Sir,—Is the present high price of rubber owing to speculation?—or is it the result of demand overtaking supply? As I am interested in a number of plantations, I have endeavoured by an examination of availablo statistics to arrive at a safe conclusion upon this question. Your issue of September 6th contains a report from Mr Carruthers, in which he says that in Ceylon 184,000 acres have been planted, and estimates that there are 175 trees to the acre, or a total of 37,440,000 trees, and that in Malaya there are 241,138 acres planted with 37,440,000 trees. The total number of trees is therefore about sixty-nine millions. On the assumption that sixty million trees bear one pound each of rubber five years from now, there will be in 1914 about 27,000 tons of plantation rubber put upon the market.

The world's consumption in 1907 was 69,000 tons, and it is generally believed that the demand increases at the rate of 10 per cent. per annum. In 1914 it would, therefore, amount to about 130,000 tons, though the existing high prices may possibly check the yearly demand. If the production of wild rubber remains as in recent years, though it may be less, the position in 1914 onwards may be as follows :—

	Wild.	Plantation.	Total.	Consumption.
1914	60,000, say,	27,000, say,	87,000	130,000 tons.
1915	60,000 ,,	60,000 ,,	120,000	145,000 tons.
1916	60,000 ,,	120,000 ,,	180,000	160,000 tons.

This estimate of the production of plantation rubber includes Ceylon and Malaya only. If these figures be fairly correct, it would appear: (1) That the present high price of rubber is the result of demand overtaking supply, as the former, with a 10 per cent. yearly increase on 1907, will be over 80,000 tons in 1909, and the supply of wild rubber, with the present small production of plantation rubber, will be much less than this ; and (2) that until 1914 or 1915 there will be no danger of prices falling to 3s or 4s per lb. Carefully managed estates costing not more than £25, or even £30, an acre to bring to the producing stage, will therefore remain a sound and profitable investment; but the same cannot be said of many of the schemes now being introduced, though their shares may for a time go to a premium.—Yours, etc.,

WM. O'HANLON.

Dale Street, Manchester.

[An estimate of 300 lb. per acre for 500,000 acres may be relied upon when present planted acreages are in bearing. A yearly increase of 10 per cent. in demand is conjecture only.—Ed., "I.R. J."]—*India-Rubber Journal*, Oct. 4.

MEXICAN RUBBER PLANTERS AND THE STATE.

The rubber planters of the northern part of the republic have held two meetings for the general advance of the rubber interests. In the last session a committee was named to approach the secretary of fomento and obtain government assistance. The association, represented by the committee, made several requests of the minister. They desire that a central body be formed in Mexico City for the investigation of questions relating to the subject of rubber producing and that eleven experiment stations be established in various parts of the republic for the purpose. An appropriation of $10,000 is asked for the maintonance of the central body and its laboratory. A further appropriation of $35,000 is requested for the publication of works relating to the subject, giving results achieved by the experiment stations. The secretary of fomento has not yet taken any action with regard to these requests. He may, in place of authorising this association to pursue investigations at the expense of the government, order greater emphasis on the subject in the work of the agricultural stations already established.—*Mexican Herald.*

THE COPRA TRADE.

The mercantile community in Java show increasing uneasiness at the fact that the copra produced in that island is fast losing its good name. For all that, the increasing demand for copra-oil raises the price of the Java article. The heavy demand leads dealers to set quantity above quality with the result that the latter is steadily falling off. The native growers are only anxious to make money, and have no scruples about utilising young nuts for copra, or of slovenly handling the product of the market. Young nuts never yield good copra, and drying the latter over a fire, as too many natives do, deteriorates quality. An agitation for Government inspection of copra, has been set on foot, and against its exportation unless under official certificates. The European export merchants are divided on this point. Most of them see only harm in official meddling, and the cry has come to nothing.—*Straits Times*, Oct. 14.

COPRA IN BRITISH SOLOMON ISLANDS

THE RESIDENT COMMISSIONER, B. S. I. IN COLOMBO.

We had the pleasure of a visit today from Mr. Chas. Morris Woodford, the Resident Commissioner of the British Solomon Islands, who is a passenger by the "Otranto," returning to his post after a holiday in England. Mr. Woodford's charge consists of the southern islands of the group, viz., Shortland Island, Choiseul, Isabel, New Georgia, Guadalcanar, Malaita, San Christoval, Bellona, and Rennell Islands, together with Ongtong-Java, and other smaller islands in the vicinity of the main group, and all lying between the 7½ and 13th degrees of south latitude, and the 150th and 163rd degrees of east longitude. Trade and industry are gradully developing in these out-of-the-way islands where many of the natives are still said to be Head Hunters and Cannibals. There have long been a few traders, mostly of British nationality, resident in the islands; these have recently increased largely in number, and in the extent of their operations. Lever Bros., and more lately, Burn, Philps, & Co. have recently undertaken

COCONUT PLANTING ON A LARGE SCALE,

and have introduced many white men for the superintendence of labour. The principal articles of trade are copra, pearl shell, and tortoise shell. Mr. Woodford has his headquarters at Tulagi, a small island between Guadalcanar and Malaita, where there is a Customs House and Post Office. There is a fairly regular steam communication with Sydney, New South Wales. Mr. Woodford thinks there is a future before these islands especially in the Copra industry. Since the advent of European enterprise and capital, due largely to Mr. Woodford's own offorts and recommendations we believe, some 12,000 acres of coconuts have been planted and the work of planting continues There are considerable areas covered with coconuts in the hands of natives which were not scientifically planted. The climate is very wet; consequently

SUN DRYING IS NOT FAVOURED BY THE NATIVES

who smoke their copra, with the result that it frequently sweats afterwards. The Copra is collected by the traders who go round in small ships purchasing it. It is afterwards sold in the open market in Sydney. Tho European planters do things on a more up to-date scale. Sun drying is adopted when possible and drying kilns have been erected. Though Copra is the principal industry of these islands, and an expanding one with a bright future before it, rubber is not neglected; and when Mr. Woodford left for home, some 400 acres had been already planted. Labour is not too plentiful, Melanesians mostly being employed in agricultural work.

Mr. Woodford is a young and vigorous official who has already given about

26 YEARS SERVICE TO THE CROWN IN THE REMOTE OUTPOSTS OF EMPIRE,

having previously served in Fiji, as Consul in Samoa, and Deputy Commissioner for the West Pacific. We wish him a safe voyage back to his island home and trust he may have the satisfaction of seeing the trade and industry of his little Kingdom rapidly expand still further under his administration.

THE WORLD'S COCOA.

PRODUCTION AND CONSUMPTION.

The following particulars of the production and consumption of cocoa in the years 1906-8 are extracted from the "Gordian," the German paper dealing with the cocoa trade:—

COCOA CROP OF THE WORLD.

Countries. [Kilog. =2·204 lb.]	1906. Kilogs.	1907. Kilogs.	1908. Kilogs.
Brazil	25,135,000	24,528,000	32,956,000
Ecuador	23,428,897	19,670,571	32,119,110
San Thomé	24,619,560	24,193,980	28,560,300
Trinidad	12,983,467	18,611,430	21,737,070
Santo Domingo	14,312,992	10,151,374	19,005,071
Venezuela	12,864,609	13,471,090	16,303,196
British West Africa	9,738,964	10,451,498	14.256,634
Grenada	4,931,530	4,612,100	5,108,245
Hayti	2,107,905	2,350,000	3,150,000
Ceylon	2,509 622	4,699,559	2,836,215
German Colonies	1,367,977	1,966,336	2,737,529
Jamaica	2,505,6 8	2,218,741	2,694,381
Dutch East Indies	1,849,847	1,800,153	2,538 841
Fernando Po	1,557,864	2,438,856	2,267,159
Surinam	1,480,568	1,625,274	1,699,236
French Colonies	1,262,090	1,387,219	1,500,000
Cuba	3,271,969	1,713,330	862,631
Saint Lucia	716,200	750,000	700,000
Belgian Congo	402,429	548,526	612,000
Dominica	572,948	590,633	498,821
Costa Rica	176,243	277,884	340,375
Other Countries	1,000,000	1,000,000	1,000,000
Total	148,794,289	149,057,054	193,482,814

COCOA CONSUMPTION OF THE WORLD.

Countries.	1906. Kilogs.	1907. Kilogs.	1908. Kilogs.
United States	37,948,575	37,526,505	42,615,293
Germany	35,260,500	34,515,400	34,351,900
United Kingdom	20,132,040	20,159,472	21,051,520
France	23,403,800	23,180,300	20,444,500
Netherlands	11,224,000	12,219,249	15,821,000
Spain	5,636,821	5,628,239	6.580,113
Switzerland	6,466,900	7,124,200	5,820,500
Belgium	3,861,686	3,253,467	4,554,081
Austria-Hungary	3.312,800	3,471,700	3,707,300
Russia	2,670,940	2,473,380	2,583,060
Italy	1,385,000	1,455,500	1.432,600
Denmark	1,190,000	1,225,000	1,200,000
Canada	1,035,182	1,115,957	1,077,034
Sweden	1,057,218	693,455	974,000
Australia	386,497	400,000	500,000
Norway	580.043	524,713	466,959
Portugal	145,604	150,000	171,572
Finland	86,252	103,804	85, 04
Other Countries	1,000,000	1,000,000	1,200,000
Total	1,56,783,858	156,223,841	164,641,936

The stocks of cocoa remaining on hand at the end of the years 1906, 1907 and 1908, were estimated at 52,345,058 kilogs., 45,204,647 kilogs. and 78,488,009 kilogs. respectively.—*Board of Trade Journal*, Sept. 30.

RESIGNATION OF DR. TREUB.

OF BUITENZORG GARDENS, JAVA.

Amsterdam, Sept. 29.—Mr. Lovink, Director-General of Agriculture in Holland, has been appointed Director of the Department of Agriculture in Netherlands India, and will retire from his present position Nov. 1st. Mr. Lovink will be the successor or Dr. Treub at Buitenzorg, whose resignation is much regretted, but who is fortunately replaced by a first-class man. The new functionary will leave in the middle of November by the ss. "Rembrandt," together with the Governor-General Mr. Idenburg."—*L. and C. Express.*